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ABSTRACT

This study of doctoral needs in New York State indicated: (1) In 1970-71 New York graduated about 11% of the Nation's doctorates. (2) New York's system of doctoral education has many individual institutions and programs of high quality. (3) With a few notable exceptions, there has been little significant sharing of resources or interinstitutional cooperation among doctoral programs. (4) There is evidence that the dimensions and nature of future employment for doctorates is changing significantly. (5) Average doctoral education costs per full-time equivalent students are estimated at five times those of undergraduate education. (6) There is evidence that barriers to equal access for all qualified students still exist in New York's doctoral programs. An extensive bibliography and statistical data are included. (Author/MJM)

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Meeting the Needs of Doctoral Education in New York State

A REPORT WITH RECOMMENDATIONS

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NEW YORK STATE BOARD OF REGENTS
COMMISSION ON DOCTORAL EDUCATION
ALBANY, NEW YORK 12224
JANUARY 1973

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Meeting the Needs of Doctoral Education in New York State

A Report With Recommendations
to the
NEW YORK STATE BOARD OF REGENTS
by the
REGENTS COMMISSION ON DOCTORAL EDUCATION

Robben W. Fleming, Chairman
Robert A. Alberty
Germaine Breé
Thomas F. Jones, Jr.
Edward M. Kresky
John P. Miller
Frederick P. Thieme
T. Edward Hollander, Executive Secretary
Vernon Ozarow, Staff Director

This report was supported in part by a grant from the
Carnegie Corporation

Albany, New York
January 1973

THE UNIVERSITY OF MICHIGAN

ANN ARBOR

OFFICE OF THE PRESIDENT

January 15, 1973

The Honorable Joseph W. McGovern
70 Pine Street
New York, New York 10005

Dear Chancellor McGovern:

I am pleased to transmit to you the report of your Commission on Doctoral Education in New York.

The report and recommendations are self-explanatory, but I would make two points on behalf of the Commission. The first is that we felt our recommendations would be more helpful if phrased in terms of principles rather than specifics. The second is that implementation of the principles we have set forth can, in our judgement, best be carried out by involvement of peer groups who are closest to and most familiar with the problems.

The Regents have the hard and not very popular task of deciding whether to accept and implement our report. We claim no wisdom beyond that accorded experienced educators, but we have attempted to set forth our best advice on the difficult problems which you posed to us. We shall watch with interest your reaction to the report.

My colleagues and I have enjoyed this opportunity to work together. We hope we have performed a useful service.

Sincerely,

R. W. Fleming

R. W. Fleming
Chairman

Members of the Commission:

Robben W. Fleming (Chairman), University of Michigan
Robert A. Alberty, Massachusetts Institute of Technology
Germaine Breé, University of Wisconsin
Thomas F. Jones, Jr., University of South Carolina
Edward M. Kresky, Wertheim and Company
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T. Edward Hollander (Executive Secretary), NYS Education Department
Vernon Ozarow (Staff Director), NYS Education Department

FOREWORD

In contrast to the rapid expansion of the 1960's, doctoral* education in this decade has clearly entered a period of major reassessment and readjustment. One major reason for the review of priorities is the serious financial stress experienced by the higher education community generally and doctoral institutions particularly. This stress has been exacerbated by the curtailment of government support at all levels. In addition, the demand for doctorates characteristic through the 1960's has largely been satisfied. According to many prognosticators, the Nation may be facing a glut of doctorates in the next decade and beyond in many fields, unless the present rate of doctorate production is moderated. Finally, there has been growing a general concern and disaffection over how the universities have actually been serving individuals and the Nation.

These national problems have special dimensions in New York State. During the 1960's the State and New York City university systems developed comprehensive doctoral programs. The long established private sector expended its doctoral programs and developed some new ones as well. Thus, three doctoral education systems, if the collection of private institutions can be so characterized, each at a different stage of maturity, faced a series of complicated problems that threatened their development, quality, and in some cases, survival. These conditions and problems led the Commissioner of Education and the Board of Regents of New York State to take two actions.

Acting upon the advice of an advisory committee in the fall 1971, the Commissioner imposed a 1-year moratorium (since extended to fall 1973) on new programs in all the State's institutions, both public and private. The moratorium was designed to provide the opportunity to study the problems of doctoral education and devise means for dealing with them.

In January 1972, the Regents announced the appointment of a Regents Commission on Doctoral Education which was given the charge to make recommendations to the Regents for developing policy to meet present needs and to guide the future development of doctoral education in the State. The commission was chaired by Robben W. Fleming, president of the University of Michigan. Other members of the commission were Robert A. Alberty, dean, school of science, Massachusetts Institute of Technology; Germaine Brée, Vilas professor of French and permanent member, Institute for Research in the Humanities, University of Wisconsin; Thomas F. Jones, Jr., president, University of South Carolina; Edward M. Kresky, vice president, Wertheim and Company; John P. Miller, professor of economics and director, Institution for Social and Policy Studies, Yale University; and Frederick P. Thieme, president, University of Colorado. T. Edward Hollander, Deputy Commissioner of Higher and Professional Education, New York State Education Department, served as executive secretary of the commission, and Vernon Ozarow, director, Office of Science and Technology, New York State Education Department, served as staff director for the study.

The commission had five formal meetings during the year, complemented by individual conferences. At two of these meetings, in the spring and fall of 1972, the commission met with the chief executive officers and other representatives of the State's doctoral granting institutions to discuss the progress of the study with them and to solicit their observations. In addition, the Regents Advisory Council for Graduate Education, consisting of many of the graduate deans of the State's universities, was kept informed of the study's progress and their observations, too, were sought.

The commission deserves the deepest thanks and gratitude for the effort they expended and for the interest they showed. They gave generously of their time and energy. Most of the meetings were for more than 1 day and some extended into weekends.

Four studies to provide background and information for the project were commissioned. Special thanks are due the authors of these studies: Robert Blackburn and Paul Lingenfelter of the Center for the Study of Higher Education at the University of Michigan who wrote a paper on the assessment of quality; Marvin Peterson and John Waggett, also of the center, who wrote a paper on interinstitutional cooperation and coordination; David Dresser and David Chapman of Syracuse University's Department of Higher Education who wrote a paper on the financing of doctoral education; and Robert McHugh, consultant to the commission, who compiled an extensive

* This report deals with degrees such as the Ph.D. and Ed.D. It does not include professional degrees such as the M.D., D.D.S., and D.V.M.

statistical report on doctoral education in New York and prepared the appendix to this report.* Jack Bulloff of State University at Albany contributed information on national manpower statistics. Michael Cruskie of the Office of Higher Education Planning in the New York State Education Department deserves thanks for his help with statistical studies as does the Department's Bureau of Statistical Services and the counterpart offices of the State's institutions who so cooperatively responded to the commission's request for information. Many other individuals in universities throughout the State and in the Education Department are deeply thanked for the many kinds of help they provided.

In addition, officials of the Ford Foundation and the Woodrow Wilson National Fellowship Foundation, the American Council on Education, the Center for Research and Development in Higher Education at Berkeley, the National Research Council, and the National Science Foundation also supplied pertinent information, often at considerable effort to themselves. Their unstinting cooperation is much appreciated.

Special thanks are due Robert McHugh who contributed in many ways during the course of the study. He and David Potts of Union College, to whom special thanks are also extended, were responsible for writing several drafts of the report. Barbara Hughes, Ellen Murphy, and Joan Forcucci assisted in research and helped in innumerable ways, often within demanding schedules.

Finally and importantly, grateful acknowledgement is made to the Carnegie Corporation for their generous grant which contributed importantly to the support of the study.

V.O.

Albany, New York
January 1973

* A limited number of copies of these reports are available from the authors or from the Office of Science and Technology, NYS Education Department, 99 Washington Avenue, Albany, N.Y. 12210. Excerpts from these reports are found in the appendix.

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SUMMARY

Findings, Conclusions, Recommendations

Major Findings

(1) In 1970-71 New York graduated about 11 percent of the Nation's doctorates.* This varied among fields from 8 percent in the biological sciences to 13 percent in the arts and humanities. The State's growth in doctoral production during the 1960's was 107 percent and may be compared with the national growth of 203 percent during the same period. In the last 2 years, however, there has been a decline in first year enrollments in the State, presaging a leveling off of doctorate production in the latter 1970's.

In 1960 the public institutions accounted for 8 percent of the State's doctorates, whereas in 1970 they accounted for 20 percent. By the end of the 1970's the public institutions are expected to account for at least 30 percent of the State's doctorates. Overall, New York now appears to have doctoral programs sufficient to meet the State's needs for the next decade in terms of such factors as comprehensive coverage of fields of study, geographical distribution of programs and institutions within the State, and institutional resources of faculty and facilities in relation to probable enrollment demands.

(2) New York's system of doctoral education has many individual institutions and programs of high quality as indicated by the latest (1969) American Council on Education survey of graduate faculty quality which ranks programs among four categories ranging from "good to distinguished" to "marginal to inadequate." This survey covers 36 fields. Not included are such areas as education, and business and management. A significant number of new programs were not rated because they had not yet graduated the required number of doctorates. About 33 percent of the enrollment in the 36 fields is presently in unrated programs. This survey indicates, as do a number of other measures, however, that the overall ranking of New York as compared with other states, although good, is not outstanding.†

There are many ways to analyze the data of the American Council on Education's survey. Using methods measuring the distribution of rated programs in the State among the four quality categories, New York ranked between fifth and tenth among the states graduating the largest numbers of doctorates. Choice of institution by National Science Foundation and Woodrow Wilson Fellowship recipients is another indicator of quality of doctoral programs. A measure used was the ratio of the number of fellowship holders attending institutions in a state to that state's production of doctorates. In 1970-71, for National Science Foundation Fellowship holders and for degrees in the sciences, New York ranked sixth among the states having the largest doctoral production, and for Woodrow Wilson Fellowship holders and degrees in the social sciences and humanities, New York ranked third.

Within the State there have been, in recent years, small but definite shifts in enrollment and doctoral production away from the higher rated (according to the American Council on Education study) programs. Recalling that about 33 percent of present doctoral enrollment in surveyed fields is in unrated programs, the dilution of quality is probably somewhat greater than that perceived, based on the principle that programs usually take considerable time to achieve quality. These same trends are even more marked nationally, and it has been predicted that they will continue in this direction through the 1970's.

(3) With a few notable exceptions, there has been little significant sharing of resources or interinstitutional cooperation among doctoral programs. Coordination and planning for doctoral education on a statewide, regional, or even individual interinstitutional basis has been, until very recently, quite limited.

(4) There is evidence that the dimensions and nature of future employment for doctorate's is changing significantly. The academic sector which traditionally employed about half of the doctorates graduated (about 90 percent in one discipline) will have sharply decreasing employment opportunities. If projections of generally reduced research and development expenditures throughout the Nation are accurate, then fewer doctorates will be needed for those activities. In addition, studies estimate

* This report deals with degrees such as the Ph.D. and Ed.D. It does not include professional degrees such as the M.D., D.D.S., and D.V.M.

† The 10 states graduating the largest numbers of doctorates in 1970-71 were, in order: New York, California, Illinois, Massachusetts, Michigan, Pennsylvania, Ohio, Indiana, Texas, and Wisconsin.

that in the future a greater proportion of doctorates will be engaged in activities other than research and development, which has been their traditional type of work activity. Also, in research and development activities, generally, relative emphasis is shifting from support of basic to applied work with definite societal problem orientation.

(5) Average doctoral education costs per full-time equivalent (FTE) student are estimated at five times those of undergraduate education. They are a major factor in the financial stress experienced by doctoral-granting institutions. This is illustrated by the fact that in the State's major doctoral-granting institutions estimated annual costs for doctoral education are about 26 percent of total educational costs, with doctoral students making up about 11 percent of the total enrollment. These estimates included the medical and dental schools at all but one of the institutions because of the difficulty of separating their costs from the total. If all of the medical and dental schools were omitted, the proportion of costs attributable to doctoral education included within the scope of this report would have been significantly greater.

There is a danger that many doctoral programs, including highly rated ones, are being and will be eroded under continuing conditions of financial stress. The collective deficits of the private doctoral-granting institutions amount to almost $30 million annually and are projected by the institutions at about this level through the 1970's. Public institutions are not permitted to run deficits, but there is evidence that their support for doctoral education is falling significantly.

(6) There is evidence that barriers to equal access for all qualified students still exist in New York's doctoral programs. These barriers are most generally financial. There is evidence that barriers still exist for minority group members and women, although progress has been made recently. It appears that, at this time, a major barrier to minority group members achieving representative enrollment is derived from the various disadvantages they still suffer at all the predoctoral levels of education.

Conclusions

(1) New York should move toward developing doctoral education within the State from the viewpoint of its comprising an interrelated system including both the public and private institutions. It should encourage all forms of interinstitutional cooperation and coordination to the end that high quality, economy, and efficiency, together, are increased as much as possible. These attributes should be fostered by every other means as well.

(2) At both the institutional and state levels the doctoral programs should be reviewed and reevaluated to determine their quality and need. The latter includes many factors ranging over a broad spectrum: the general need to increase and transmit knowledge, the need to produce skilled manpower for employment, the need to develop understanding and methodologies that may be used to deal with societal problems, and the need for new forms and types of programs in doctoral education. Quality also has many facets which should be assessed by combination of objective and judgmental criteria. At this time, in addition to the conventional and still vitally important attributes of quality, such aspects as appropriateness of programs for students' career aspirations and the social role of doctoral programs should be given somewhat more attention than in the past.

(3) The State should make the necessary commitment to insure that the high quality and needed doctoral programs in both the public and private institutions are sustained. In a time of fiscal constraint and review and retrenchment in doctoral education, resources should be concentrated in support of these programs. Programs not meeting standards of present or potential high quality, and need should be phased out.

Qualified doctoral programs at the private institutions should receive increased Bundy aid within limits established by the cost subvention and other considerations for similar programs at the public institutions. Economies to the State in subsidizing such doctoral programs are obvious. Similarly, the State should concurrently insure an adequate level of support for high quality and needed programs at the public institutions. Having established doctoral programs at the public institutions, the State has a responsibility to foster those meeting the standards of high quality and need. These same considerations also apply, where appropriate, to City University and New York City.

(4) The State should take steps to assure that there is equal access to doctoral education for all qualified students. All barriers due to economic and cultural factors should be removed. A plan for tuition supplements, based on economic need of the student, to reduce the barrier imposed by tuition differentials between the public and private institutions should be established so that qualified students' choice of institution is not limited by that factor. Cultural barriers to women and minorities must not limit the equality of opportunity for access for them to any institution in the State.

(5) Realization of many of the foregoing objectives requires or would be facilitated by a strong coordinating

and planning body at the State level. The Regents are very well suited to this function in view of their historic role in the State and their mandated responsibilities for statewide coordination of planning.

Recommendations

(1) *The Regents should regard all the doctoral programs at both the public and private institutions as constituting together an interrelated system for doctoral education.*

The commission considers this recommendation to be fundamental. Doctoral education faces an abundance of complex problems at this time and its purposeful coordination at the State level is essential if New York is to preserve and strengthen its position in this vital area of higher education.

The Regents, as the responsible agency at the State level for coordinating the planning of higher education, should take steps to insure that all the State's doctoral programs, individually and collectively, are of the highest quality, that they are pursued with economy and efficiency, and that socioeconomic and cultural barriers to access are eliminated. The other recommendations of the commission are directed essentially toward the realization of these goals.

(2) *The Regents should have a general policy of concentrating programs at a relatively limited number of institutions in the interest of both highest quality and the most efficient and economical use of limited resources.*

An increasing body of information indicates that both high quality and economies of scale are generally found in institutions which have a major commitment to doctoral education and which have substantial programs in related fields. The advantage of mutual support of related programs wherein their physical and financial resources, and the interests, knowledge, and competencies of faculty and students are shared is best realized by concentrating these programs at a relatively limited number of institutions. At the same time, in a state as large and diverse as New York, due consideration must also be given to regional needs.

(3) *The Regents should establish special committees to review the quality of and need for doctoral programs in selected disciplinary areas. Only programs meeting standards of present or potential high quality, and need should be offered.*

This recommendation stresses the paramount importance of quality and need in doctoral education. Only programs meeting standards of high quality and need should be sustained. Even those programs which heretofore have been regarded as being of sufficient quality require serious review at this time of limited resources and new estimates of need. However difficult and challenging a task this recommendation presents, the problems it addresses must nevertheless be faced.

The commission recommends, *first*, that the Regents appoint evaluation committees in the disciplinary areas they wish to study and charge them with evaluating the programs according to specified criteria and procedures. The commission believes that evaluations are ordinarily best made by groups composed primarily of peers in the disciplinary area. These peers should be primarily from out-of-state, represent both the academic and nonacademic sectors, and include recent doctoral graduates.

The committees should employ combinations of objective and judgmental criteria in making their evaluations. The criteria should reflect the joint requirements of high quality and need. Among the specific factors that must be considered are quality of students, scholarly achievement of faculty, availability of laboratory and library facilities, success in graduating enrolled students, financial support, the supervision and guidance of students, and the need for each program and its appropriateness for students' career aspirations.

Within the context of this report, "need for programs" has several connotations. It includes the need to sustain the expansion and transmission of knowledge in even the most esoteric fields; the need to produce skilled manpower for employment in industry, education, government, or other sectors; the need to develop understanding and methodologies that may be used to deal with societal problems; and the need for new forms and types of programs in doctoral education. The evaluative procedure should give weight to these several aspects of need according to the special character of each discipline. Assessments of need should be made on regional, statewide, and national bases, again according to the special character of each discipline.

Consideration of the "appropriateness of programs for students' career aspirations" has generally not been emphasized enough in the evaluation of doctoral programs. The practice in most fields has been primarily to prepare scholars for research oriented careers in universities. The sharp contraction of the academic market and consequent greater likelihood of employment in other sectors and in new kinds of work activity necessitate much closer examination of the purposes and processes of doctoral education.

The commission recommends, *second*, that on the basis of the committees' reports and recommendations,

the Regents should give consideration to which programs should be sustained, placed on probation, or in case of serious deficiency, deregistered. Probation of a program should be for a period of 3 years, at the end of which time its status should be reviewed. The question of withdrawal of registration presents difficult and painful problems for all concerned. When a program that fails to meet standards has been identified, the commission recommends that the Regents, in consultation with the institution affected, arrange for its phasing out over a reasonable period of time with due consideration for the faculty and students involved.

The particular statewide evaluations recommended here are envisaged as part of the current special reexamination and reevaluation of doctoral education in the State. The commission recognizes, of course, that the regular review of programs to maintain standards in all areas of doctoral study is the continuing task of the State Education Department. The commission recommends that the Department take the same actions proposed here with regard to support and registration of all doctoral programs on the basis of their review and assessment.

(4) *New York State should lend its financial support in both the public and private sectors only to programs meeting the standards of existing or potential high quality, and need. Programs without these qualifications should not be supported.*

The commission believes it is essential that financial support of programs by the State be provided selectively on the basis of quality and need. At a time when resources are constrained and when review and reevaluation are watchwords in doctoral education, the State should not expend resources on programs which do not meet standards of high quality, and need. These funds would be much more effective if reallocated to the support of those programs that do meet such standards.

The private institutions' main source of State funds is Bundy aid. Present practice calls for awards to be made for doctoral degrees granted from all registered programs. The commission recommends that awards be made only for degrees granted from individual programs that meet the standards determined by the Regents. Programs on probation would also warrant support.

The commission also recommends that financial support for doctoral education in the public institutions be given only on a selective basis to approved programs. In addition, the present funding formula for doctoral education in public institutions, which rests on enrollment, should be modified to incorporate a factor based upon awarded degrees. It is urged that the Legislature and Governor authorize funds for support of only those programs meeting the standards of high quality, and need.

(5) *New York State should strengthen its support of all programs that meet the standards of high quality and need.*

This recommendation is advanced in recognition of the need for the State to make an unqualified commitment to support its high quality and needed programs in doctoral education. Such programs are found in both the public and private institutions. Many of these institutions are national and international research centers drawing talent and money to New York, enhancing its economic development, and making available their many resources and talents for use by industry and government.

The commission recommends that the programs at the public institutions meeting the standards of quality and need be adequately supported. The selective funding of only such programs as these, as called for in recommendation (4), would allow for the concentration of resources to increase their support. It is strongly recommended that the State and New York City make a commitment to insure that the programs in their institutions that meet the standards of quality and need that have been developed are sustained with adequate support. It is urged that the Legislature and Governor authorize these funds.

Programs of quality and need should also be supported at New York's private institutions. They historically have produced most of the State's doctorates and will continue to do so in the foreseeable future. In view of their importance to doctoral education in New York, the commission believes that the level of Bundy aid could be doubled from the present level ($2,400 per degree, or approximately $400 per year per FTE student) without raising serious questions of its being disproportionate to the State's and city's subvention of doctoral programs in public universities. The award of Bundy aid only to qualified programs as called for in recommendation (4) would allow for the concentration of resources in their support.

(6) *The Regents should sponsor increased cooperation and coordination in doctoral education by the institutions within the State.*

In order to design and promote purposeful interinstitutional cooperation in as many ways as possible, the commission recommends that the Regents direct the establishment of committees of representatives in the various disciplinary areas from the State's doctoral institutions. The commission believes that each committee

should be given a specific charge and be required to submit a report of its efforts. This system of committees should provide opportunities for both public and private institutions to achieve improved quality, economy, and student opportunity. This cooperation may proceed on a variety of levels: between individual institutions, regionally, statewide, and interstate, as the best opportunities may appear.

(7) *The Regents should insure that doctoral education at all institutions within the State be accessible to all qualified New York students. Economic and cultural barriers to the realization of this goal should be eliminated.*

This recommendation has a number of facets, but its essence is that access to doctoral education must be equally available to all qualified students at all the institutions, both public and private, within the State. The commission recommends that the Regents insure that economic and cultural barriers do not prevent the realization of this goal.

In furtherance of this objective the commission recommends that differences in tuition between the public and private institutions be considered to prevent this economic factor from limiting students' range of opportunities for doctoral education. The financial grants to be provided New York students in such a new program to achieve this objective should be based on need. In devising formulae for this purpose, however, these grants should not, when coupled with Bundy aid to the private institutions, exceed the limits established by the public cost subvention for doctoral education at the public institutions.

In addition, the commission recommends that sex and minority group membership be eliminated as barriers to enrollment in doctoral programs for qualified students. The Regents are urged to continue their efforts to insure that women and others heretofore excluded by those barriers have full opportunity to secure doctoral education so that they may subsequently participate more widely in society in all those activities requiring such preparation.

(8) *The Regents should require that, as part of the 1974 Statewide Master Plan Progress Report, all the doctoral-granting institutions be required to review their doctoral programs from the point of view of determining anew their purpose, place, and need in overall institutional plans.*

This recommendation is made to emphasize the responsibility and opportunity institutions have, particularly at this time and in conjunction with this specific study, to review their plans with respect to doctoral programs. The review should include consideration of the many factors that have been discussed in this report, such as the quality of and need for doctoral programs, but should also consider the relative importance of these doctoral offerings to the institutions' overall programs. The commission is particularly sensitive to the need for institutions to reconsider the benefits of allocation of resources to doctoral programs as compared with other needs on the campus.

It may be said that such reviews are part of the regular ongoing business of an institution and indeed it is expected that this is so. The reason for emphasizing it at this juncture is that within the context of the recommendations proposed in this report, a significant atmosphere for change is generated. The opportunity for effecting such change, where warranted, should not be lost.

(9) *The Commissioner of Education should end the moratorium on new doctoral programs when ready to implement criteria and procedures that will insure that any new programs fully meet rigorous standards of potential quality, and need.*

The commission recommends an end to the moratorium under the condition stated. They recommend that procedures be established that are appropriate to apply criteria for new programs: (1) The program must have a definite, strong commitment for support from its institution; (2) the proposed program should give definite promise of as high or higher quality than existing programs in the same field; (3) the need for the program must be clearly demonstrated; and (4) the impact of the new program on existing programs in the same field should be analyzed so that overall statewide strengths are preserved.

Introduction

The large number of publications on virtually every aspect of doctoral education* in recent years and the prominence of the organizations and individuals who sponsor and are engaged in these studies attest to the important place of doctoral education in higher education and in society.[1] Many of these analyses call for the co-

* This report deals with degrees such as the Ph.D. and Ed.D. It does not include professional degrees such as the M.D., D.D.S., and D.V.M.

[1] Many of the Carnegie Commission reports on higher education deal in part with doctoral education. Among these are "The More Effective Use of Resources"; "The Capitol and the Campus"; "Less Time, More Options"; "New Students and New Places"; "Quality and Equality: New Levels of Federal Responsibility for Higher Education." Other recent major studies include Kenneth D. Roose and Charles J. Anderson, "A Rating of Graduate Programs." Washington, D.C.: American Council on Education, 1971; The National Science Board, "Graduate Education: Parameters for Public Policy." Washington, D.C.: United States

ordination of planning at the State level as a means of dealing with the problems of effective allocation of limited resources.[2]

It is clear that in New York, with its uniquely diverse array of doctoral-granting institutions, the State has a vital role to play in sustaining and promoting the orderly development of doctoral education. This is evident for a number of reasons. Doctoral education enriches and strengthens New York's own educational and cultural resources. In addition, many of New York's doctoral-granting institutions are national and international educational and research centers, drawing talent and money to the State. These institutions enhance the State's economic development by making available their staff and facilities for use by industry, attracting particularly those requiring the unique resources of universities. Government, too, draws upon the many talents and expertise in such institutions for a wide variety of uses and purposes. Finally, it must be noted that although in past years New York has been a net exporter of doctoral recipients to the rest of the country, and indeed to other nations, the State has also retained a higher percent of its doctoral recipients than most other major doctoral-producing states. All of these considerations, in conjunction with the major problems faced by doctoral institutions, are compelling reasons for a study such as this, which is directed to make recommendations to the Regents for policy to meet present needs and to guide the future development of doctoral education in the State.

The report has three sections. The first part examines the dimensions of education in New York in terms of the range of existing resources, probable needs, quality, costs, and student access. The second section discusses objectives in doctoral education that the commission believes to be of central importance. These objectives are high quality and responsiveness to changing needs; increased economy, efficiency, and effectiveness in the use of resources; and the removal of financial and cultural barriers of access for qualified students. The report concludes, in the third section, with the commission's recommendations in support of these objectives.

Government Printing Office, 1969; Frank Newman, et. al., "Report on Higher Education." Washington, D.C.: United States Government Printing Office, 1972; John H. Powel, Jr., and Robert D. Lamson, "Elements Related to the Costs and Benefits of Graduate Education." Washington, D.C.: The Council of Graduate Schools, 1972; Earl F. Cheit, "The New Depression in Higher Education: A Study of Financial Conditions at 41 Colleges and Universities." New York: McGraw-Hill, 1971; Ann M. Heiss, "Challenges to Graduate Schools." San Francisco: Jossey-Bass, 1970; the studies emanating from the Ford Foundation Program for Research in University Administration; the studies of manpower and funding by the National Science Foundation; and the first report of the National Board on Graduate Education, "Graduate Education: Purposes, Problems and Potential." Washington, D.C., November 1972.

[2] See, for example, Lyman Glenny, "Doctorate Planning for the Seventies: A Challenge to the States," in "Effective Use of Resources in State Higher Education." Atlanta: Southern Regional Education Board, 1970; Dael Wolfle and Charles V. Kidd, "The Future Market for Ph.D.'s," Science, vol. 173, pp. 784-793; Robert O. Berdahl, "Statewide Coordination of Higher Education." Washington, D.C.: American Council on Education, 1970. See also the Carnegie Commission reports, op.cit.

I. The Dimensions of Doctoral Education in New York

Retrospective: The 1960's

The late 1950's and 1960's were a time of widely perceived need throughout the Nation for a great expansion of doctoral education to meet shortages of highly trained manpower in a wide range of fields and employment sectors. The universities and colleges needed staff to meet the demands of unprecedented growth. Industry and government were eager to employ the highly trained doctoral recipients in their burgeoning research and development programs. Consistent with these needs, the Heald Committee in 1960 called for a dramatic increase in New York's commitment to higher education.[3] New York's existing institutions seemingly lacked the resources to meet the State's and Nation's increasing needs. The committee recommended that the State University develop major research universities offering a comprehensive set of doctoral programs. In consequence, the State University developed four major university centers offering doctoral programs. In addition to the Heald Committee's recommendations for the State University, a decision was made to develop doctoral programs within the municipal college system of New York City. The City University of New York and its Graduate Center were developed accordingly. The growth of doctoral education in these two public systems has been dramatic. Between 1960 and 1970 doctoral output in the public sector increased from 120 to 691 (476 percent). In 1960, the public institutions produced 7 percent of the State's doctorates; in 1970, it was almost 21 percent. Five more major institutional units offered doctoral programs in 1970 than in 1960 in the public sector.

In the 1960's, a number of private institutions undertook major expansions of doctoral programs and enrollments. The private sector accounted for two-thirds of the increase in the total State doctorate output between 1960 and 1970. Collectively, these private institutions increased their production of doctorates by 77 percent. Some individual private universities increased production much more sharply; for example, Syracuse increased annual doctorate output by 213 percent; Cornell, by 154 percent; and Rochester, by 243 percent during this period. Five more private institutions awarded the doctorate in 1970 than in 1960. Table 1 shows the increases in doctorate production by major sector. (See appendix A for details.)

TABLE 1
Doctoral Degrees Awarded in New York, 1960 and 1970

Type of Institution	Number 1960	Number 1970	Percent of Increase 1960-70
Total Public	120	691	475.8
SUNY	120	597	397.5
CUNY		94	
Total Private	1,477	2,618	77.3
Multiversities	908	1,882	107.3
All Other	569	736	29.3
New York State	1,597	3,309	107.2

Source: Higher Education General Information Survey, Degrees, Awarded, 1970-71; NYS Education Department, "College and University Degrees, 1960-61."

New York as a whole increased doctorate output by 107 percent between 1960 and 1970, and the number of doctoral-granting institutions increased by 50 percent. This doubling of the State's annual doctoral production during the 1960's should be seen in the perspective of a

TABLE 2
New York Doctoral Production Compared to United States Production
1965-66 and 1970-71

Field	N.Y.S. Doctorates 1965	N.Y.S. Doctorates 1970	N.Y.S. Percent of U.S. Doctorates 1965	N.Y.S. Percent of U.S. Doctorates 1970
Physical Sciences	382	641	10%	11%
Engineering	244	340	11	10
Biological Sciences	243	418	8.5	8.3
Arts and Humanities	326	566	13	13
Education	374	617	12	10
Social Sciences	355	641	13	12
Professional Fields	82	126	11	9
TOTAL	2,006	3,349	11	11

Source: National Research Council, "Doctorate Recipients From United States Universities, 1958-1966," (1967); National Research Council, "Summary Report 1971. Doctorate Recipients From United States Universities, (1972)."

[3] Committee on Higher Education, Henry T. Heald, chairman, "Meeting the Increasing Demand for Higher Education in New York State. A Report to the Governor and the Board of Regents." Albany, N.Y. 1960.

national tripling of doctoral production during the same period. Whereas New York accounted for about 15 percent of the national doctoral production in 1960, in 1965 and 1970 it was about 11 percent. New York's increase in both the public and private sectors nevertheless remains impressive. The State's recent production by major field is shown in a national context in table 2.

A. The Present Distribution of Resources

New York has comprehensive and diversified resources for doctoral education, as indicated by the number and distribution of institutions, programs, and enrollments in both the public and private sectors. This section briefly elaborates on these aspects of the State's doctoral education system. It also notes the still limited extent but substantial potential of interinstitutional cooperation and coordination in doctoral education.

1. Institutions, Programs, and Enrollments

Diversity of Institutions

New York's system of doctoral education is both remarkably diverse and comprehensive in institutions and programs. Twenty-eight private institutions and 14 units of the State University of New York and The City University of New York grant the doctorate. (See appendix A for detailed listing.) These institutions constitute a thoroughly mixed economy of institutions: large and small, comprehensive and specialized, public and private.

Though 42 institutions grant the doctorate, production is concentrated in seven private and six public institutions. These 13 institutions accounted for 83 percent of the State's doctoral enrollments in 1971-72.[4] Complementing the major doctoral-producing institutions are a variety of institutions either specialized (as in theology, music, education, and engineering) or substantially more limited in commitment to doctoral programs. The doctoral output of most of this latter group is numerically small compared to the State total, though often important to specialized needs. This group of 29 institutions, each having less than 2 percent of the State's doctoral enrollment in 1971-72, accounted collectively for 17 percent of total State doctoral production.

[4] The 13 institutions each accounted for over 2 percent of total New York State doctoral enrollment, fall 1971. The public institutions are the State University Centers at Albany, Binghamton, Buffalo, and Stony Brook, and The City University of New York Graduate Center. The private institutions are Columbia, Cornell, Columbia Teachers College, New York University, Syracuse, Rochester, and Fordham.

Geographic Distribution of Institutions and Enrollments

There is a wide geographic distribution of doctoral institutions and programs within New York State. The four comprehensive State University Centers are widely dispersed in Stony Brook (Long Island), Binghamton, Albany, and Buffalo. The City University Graduate Center represents the public sector in New York City. Of the six comprehensive private institutions, three are in New York City, one in Rochester, one in Syracuse, and one in Ithaca. In 1971-72, 55 percent of the State's doctoral enrollment was in New York City institutions, with the remainder distributed mainly in the other major population areas of the State. The public institutions have particularly well distributed enrollments. The geographic distribution of enrollments is shown in table 3.

TABLE 3
Percent of Total Doctoral Enrollments in New York Higher Education Planning Regions Fall 1971

Region	Public Institutions	Private Institutions	Total	N.Y.S. Population (1970)
Western	23.4%	0.1%	7.9%	9.1%
Genesee Valley		6.1	4.0	7.1
Central	23.5	18.2	20.0	6.9
Northern		0.6	0.4	1.5
Northeast	8.8	2.5	4.6	8.2
Mid-Hudson				10.0
Metropolitan	27.3	70.2	55.8	43.3
Long Island	17.0	2.3	7.3	14.0
New York State				
Percent	100%	100%	100%	100%
Number	9,027	17,932	26,959	18,241,000

Source: Higher Education General Information Survey, Advanced Degree Enrollments, Fall 1971.

Student Residence and Migration

Data on student residence and migration also suggest substantial and widespread opportunity for doctoral study. While New York has been a consistent net exporter of undergraduate students, it has been an equally consistent net importer of graduate students. In addition, about 85 percent of graduate students who are New York State residents remain in New York for graduate study. A relatively high percent (46) of New York baccalaureates who receive the doctorate obtain it in New York. (Among major doctoral-producing states in the period 1960-66 only California, Texas, and Michigan re-

tained a higher percent.) Analysis of the home residence of all doctoral students (in 1968) shows that 70 percent were New York residents. While some doctoral institutions in the State are strongly cosmopolitan in student origins, others draw strongly upon State and local residents for doctoral enrollment. Among the five private multiversities, for example, the percent of 1968 doctoral students who were New York State residents ranged from 38 percent to 89 percent. (See appendix B for detail.) Data on intrastate migration of graduate students in New York indicate that only in the Mid-Hudson and Long Island regions is there a large net outmigration. New York City and the Central region of the State are major net importers of graduate students. (See appendix B for detail.)

Distribution of Programs by Field and Institutional Control

New York has a substantial number of programs in virtually all major fields and most specialized fields. In addition, as the discussion on the distribution on quality will indicate, New York has high quality programs in most academic disciplines. The comprehensiveness of New York's programs is indicated in table 4, which shows the number of institutions reporting doctoral enrollments in major fields by public and private sector. For example, New York has 24 institutions with one or more doctoral programs in the biological sciences, 13 institutions with doctoral programs in education, and 20 institutions with doctoral programs in psychology. (See appendix A for distribution of programs by subfield.)

Table 4, in showing the distribution of doctoral enrollments between the public and private sectors in 1971-72, illustrates the substantial degree to which the public institutions have succeeded in developing a comprehensive system of doctoral education in most major fields. The public sector accounted for about 33 percent of New York's total doctoral enrollment in 1971-72, with a relatively high proportion of the statewide enrollments in fields such as biology, foreign languages, and letters, and a relatively low percent in education and fine arts. (See appendix A for distribution of enrollments by subfield.) New York can now be said to have a well developed tripartite system of doctoral education consisting of the aggregation of private institutions, The City University of New York (accounting for about 9 percent of statewide doctoral enrollments), and the State University of New York (accounting for about 24 percent of statewide doctoral enrollments). The public share of the State's doctoral production will continue to grow in the reasonably near future, as comparison of the 21 percent public doctorates in 1970-71 with the 33 percent public doctoral enrollments in 1971-72 indicates.

TABLE 4

Number of Institutions With Doctoral Programs and Distribution of Enrollment in Selected Fields in New York by Institutional Control, 1971-72

Field	No. of Insts. With Programs		Percent of Enrollment	
	Public	Private	Public	Private
Biological Sciences	11	14	49.9	50.1
Business and Management	3	6	42.7	57.3
Computer Sciences	2	5	34.3	65.7
Education	4	9	16.7	83.2
Engineering	6	10	27.4	72.6
Fine Arts	3	5	23.2	76.8
Foreign Languages	5	6	42.3	57.7
Letters	5	11	44.6	55.4
Mathematics	6	11	34.9	65.1
Physical Sciences	6	15	32.9	67.1
Psychology	6	14	34.5	65.5
Social Sciences	7	9	34.1	65.9
All Fields Combined			33.5	66.5

Source: Higher Education General Information Survey, Advanced Degree Enrollments, Fall 1971. Number of institutions with doctoral programs based on reported doctoral enrollment.

2. Cooperation and Coordination

The distribution of resources among institutions may be influenced to a considerable extent by their shared use. The two major approaches to sharing resources are voluntary cooperative arrangements among institutions and statutory coordination by public agencies.

Voluntary Interinstitutional Cooperation

New York's higher education institutions have undertaken a variety of voluntary cooperative enterprises, ranging from cross registration of students and sharing faculty to engaging in common programs with shared facilities. A recent study cited over 425 cases of interinstitutional cooperation in New York.[5] Interinstitutional cooperation at the doctoral level is still limited, however, as a recent report on doctoral programs in New York City has shown.[6]

[5] College Center of the Finger Lakes, "Interinstitutional Cooperative Arrangements in Higher Education in New York State." Albany, N.Y.: NYS Education Department, January 1970.

[6] Regents Advisory Council for the New York City Region, A Regional Plan for Higher Education. A Report From New York City." Albany, N.Y.: NYS Education Department, June 1972.

Nevertheless, a modest number and variety of interinstitutional cooperative arrangements do exist at the doctoral level in New York among both private and public institutions and are illustrative of the possibilities. For example, State University of New York at Albany cooperates with the State University colleges in a program leading to a doctorate in educational administration. Several New York institutions have members of the staff at the Brookhaven Laboratory as adjunct faculty. Doctoral students in the Albany area may take specialized courses in any of four institutions in that area. The State University of New York has announced a program of allowing doctoral students to register for doctoral work at any of the four University Centers. Fordham, under a special program, has placed its graduate student teaching fellows at 15 cooperating liberal arts colleges. Doctoral students at State University of New York at Albany engage in advanced research at the State University College of Forestry Biological Station at Cranberry Lake. There are in addition a number of cooperative ventures that include more than doctoral level education in their operation (as in management and library cooperation) and an increasing number of informal cooperative arrangements (particularly among faculty).[7]

Statewide Coordination

The expansion of doctoral institutions and programs has been accompanied by increasing recognition of the need for planning and coordination at the State level. Under a system of statewide master planning and coordination established in 1961 and amended in 1971 by the Legislature, the Regents have the responsibility to formulate, each 4 years, a "Statewide Plan for the Development of Post-Secondary Education." The Board of Trustees of the State University, the Board of Higher Education of The City University of New York, and the governing boards of the private institutions are required to submit plans and recommendations to the Regents for approval and integration into the overall Statewide Plan. The Regents Statewide Plan is then sent to the Governor for his approval. The Legislature subsequently acts as it sees fit on the features of the Statewide Plan requiring its approval.

An orderly system of comprehensive planning and coordination thus exists for doctoral education, beginning at the institutional level and moving upward through the major planning units of State University and City University central staffs and the Commission on Independent Colleges and Universities (representing the 28 private doctoral institutions), to the Regents, the Governor, and Legislature. This institutional planning is done within the framework of statewide priorities established by the Regents as the State's coordinating and planning agency for higher education.

Regional Coordination

Within the framework of statewide planning, regionalism is a potentially important method of voluntary coordination in doctoral education. Cooperation at the regional level may well be an important means of achieving a greater economy, quality, and student opportunity in doctoral education through the more effective use of all existing resources, both public and private.

In one major initiative in this direction, the Regents in 1971 announced the formation of eight regions in New York within which programs would be developed to coordinate individual programs of both public and private institutions. A series of pilot projects has begun in different regions, responsive to local initiatives and requirements. They are under the general guidance of the Regents Advisory Council, composed of the representatives of all institutions in each region. The first such project got underway in September 1971 in New York City. The first report of this council is cited in footnote 6. A second Regents Advisory Council for the Northeastern region was announced in January 1972, and others are in early stages of organization. In addition, the State University of New York system announced the formation of regions at essentially the same time for much the same purposes. Cooperation among both private and public institutions is encouraged in this program, too. Programs of cooperation and coordination are currently underway in the Buffalo area and on Long Island under the auspices of the State University.

B. Resources for Doctoral Education in Relation to Need

New York appears to have resources for doctoral education adequate to meet both anticipated enrollment demands and manpower needs during the 1970's. The data summarized in the following discussion on recent enroll-

[7] Marvin W. Peterson and John S. Waggett, "Interinstitutional Cooperation in Doctoral Education, A Report With Recommendations" (unpublished study prepared for the Regents Commission on Doctoral Education), September 1972, pp. 69-85; State University of New York, "Inventory of Selected Interinstitutional Cooperative Arrangements as of January 1971 (Report No. 19)," Albany, N.Y.: State University of New York, September 1971.

ment trends, institutional projections of enrollments and degrees, institutional capacity for additional doctoral enrollments, and estimated national manpower needs all suggest that conclusion. Estimates of changing doctoral manpower needs suggest that major efforts should be made to direct some doctoral training to additional or new competencies.

1. Student Demand: Recent Enrollment Trend

It is now clear that the dramatic expansion of doctoral enrollments characteristic of the 1960's has peaked. Comprehensive statewide data for 1970 and 1971 shows a 2 percent decrease in total first-year doctoral enrollments in New York. Among the major sectors, only City University of New York reported an increase in first-year doctoral enrollments, while State University reported a decline of 7 percent and the private sectors a decline of 4 percent.

Data for 25 New York institutions (shown in table 5) comparing 1970, 1971, and 1972 data confirm this trend of decline in enrollments. It should be noted at the outset that this group (accounting for about 48 percent of the State's doctoral enrollment) excludes several major private universities that experienced significant declines between 1970 and 1971. The extent of doctoral enrollment decline is probably understated. Among this group of 25 institutions, then, total doctoral enrollment increased 6 percent between 1970 and 1971, but declined by 4 percent between 1971 and 1972. First year doctoral enrollment declined by 5 percent between 1970 and 1971 and by 16 percent between 1971 and 1972. Thus the trend of enrollment decline has accelerated. These data suggest that doctoral production in New York will stop increasing by 1975, when it has reached a level of perhaps 4,000 degrees.

A survey comparing 1971 enrollments with expected 1972 enrollments in a sample of institutions in New York and the United States confirms the data on table 5. This survey by the American Council on Education, shown in table 6, indicates declines in total enrollment of 15 percent in New York and 11 percent in the United States in the sciences. Only in the social sciences (be-

TABLE 6

Change in First-Year Graduate Applications and Total Enrollments in Science and Engineering in Private Institutions 1971 (actual enrollments) and 1972 (expected enrollments)

Field	Change in New Applications Received Through July 5, 1971, and 1972		Expected Change in Total Enrollment 1971 and 1972	
	N.Y.S.	U.S.	N.Y.S.	U.S.
Biological Sciences	1.8%	0.0%	−11.0%	−9.7%
Engineering	−15.0	−17.8	−17.6	−14.9
Mathematical Sciences	−8.8	−10.5	−28.7	−21.6
Physical Sciences	−18.6	−12.7	−21.5	−6.7
Social Sciences	11.2	3.8	1.2	−4.5
Total	−4.3	−5.3	−15.5	−11.0

Source: *"Expected First Year Graduate Enrollment in Science and Engineering, Fall 1972,"* Barbara A. Blandford and Joan C. Trexler, Higher Education Panel Report, Survey No. 10, American Council on Education, Washington, D.C., August 1972. The New York State sample was 10 institutions. The national sample was 38 institutions and was weighted for 85 institutions.

TABLE 5

Changes in Doctoral Enrollments, in 25 New York State Institutions,[1] Fall 1970, Fall 1971, Fall 1972 (Full- and Part-Time Combined)

Level of Enrollment	Enrollment			Change in Doctoral Enrollment			
				Net Change		Percent of Change	
	1970	1971	1972	1970-71	1971-72	1970 to 1971	1971 to 1972
First Year Enrollment	2,902	2,754	2,305	−148	−449	−5.1%	−16.3%
Enrollment Beyond First Year	9,623	10,521	10,442	+898	−79	+9.3	−1.0
Total Enrollment	12,525	13,275	12,747	+750	−528	+6.0	−4.0

[1] The 25 institutions represent approximately 48 percent of the doctoral enrollment in New York State. They include 11 units of the State University and 14 private institutions.

Source: Higher Education General Information Survey, Advanced Degree Enrollments, Fall 1970, Fall 1971, Fall 1972.

cause of an 8 percent increase in psychology) was there an increase in expected total enrollments between 1971 and 1972 in New York.

Applications also declined. There were 4 percent fewer applications in the sciences in New York in 1972 than in 1971. Only psychology and the basic medical sciences were exceptions to the pattern of decline. It should be noted, as these data suggest, that the pattern of decline is not uniform. Significant declines in enrollment have occurred in engineering, the physical sciences, mathematics, and foreign languages in New York, but not in such fields as biology, education, fine arts, and psychology.

2. Projected Enrollments and Degrees

The changing pattern of enrollments is reflected to some degree in institutional estimates of future enrollments and degrees. The doctoral-producing institutions in New York collectively expected their full-time equivalent enrollment to increase from 18,760 in 1970 to about 22,000 in 1975 and about 26,000 in 1980 (a 38 percent increase over the decade) according to their 1972 master plans. Statewide doctoral degree output is expected to increase about 50 percent between 1971 and 1980 under these projections, in contrast to the 107 percent increase between 1960 and 1970. These institutional estimates would result in statewide production of 4,957 doctorates in 1980. The public sector would account for about 75 percent of the total State increase between 1970 and 1980 under these projections, and for about 39 percent of total State doctoral output in 1980.

The collective increases in doctoral enrollment and production projected in 1972 by New York's doctoral-producing institutions should be regarded as "high" estimates, however. Projections by a number of private institutions appear to underestimate the decline in doctoral enrollments as well as in the undergraduate enrollments which form an important base of support for doctoral programs in some institutions. Projections by some institutions also include unreasonably low attrition rates. In the public sector, too, the pattern of enrollment growth which would have increased public output by a factor of about 2.5 during the 1970's has already slowed down dramatically, and in the case of the State University has been reversed. A reasonable "low" estimate of statewide full-time equivalent doctoral enrollment in 1980 is judged to be 24,000 students, a 26 percent increase over 1971. A reasonable "low" estimate of State doctoral output in 1980 would be 4,300 (a 30 percent increase over 1970).

These estimates of limited growth in doctoral enrollment and production for New York in the 1970's correspond to national estimates. Graduate deans in 29 major doctoral-granting United States institutions recently estimated that their institutions would collectively experience a 5 percent decrease in doctoral enrollments between 1972 and 1976. Because of the recent and expected declines in enrollment, some commentators predict as few as 35,000 United States doctorates for 1980, expecting annual production to decline slightly after 1975 in reflection of recent enrollment trends. Charles Kidd, Allan Cartter, and the National Science Foundation have more realistically estimated that United States production will be between 40,000 and 45,000 in 1980.[9] A New York doctoral output of about 4,300 is consistent with these latter national projections.

Thus, while enrollment patterns can shift quickly and while recent enrollment data do show sharp variations in enrollment trends between fields, it seems likely that student "demand" for doctoral education will continue to be much lower than student "demand" in the 1960's. This will occur in response to shifting student values, reduced doctoral manpower demands in traditional employment activities, and the curtailment of enrollment stimulating doctoral student fellowships and assistantships. Recent enrollment data thus suggest a general policy of continued restraint on the growth of the State's doctoral programs.

3. Institutional Capacity

A recent survey of doctoral institutions in New York indicates adequate present capacity to meet doctoral enrollment demands in the 1970's in most fields. The institutions were asked to estimate their 1971-72 enrollment capacity as determined only by faculty, facilities, and resources presently at hand or firmly committed. Responses from 24 institutions representing 65 percent of the State's doctoral enrollment showed enrollment to be in the neighborhood of 77 percent of capacity, as indicated in table 7. The major doctoral-producing institutions operated at between 57 percent and 97 percent of capacity at the doctoral level. Patterns of surplus capacity were similar among institutions within both the public and private sectors.

When the sample is weighted to include all doctoral institutions in New York there is an estimated surplus of

[8] Cited in Charles V. Kidd, "Federal Support for Graduate Education in the Seventies," (unpublished paper), October 1972, p. 16.

[9] Charles V. Kidd, op. cit., p. 16; Allan M. Cartter, "Scientific Manpower for 1970-1985," Science, vol. 172, p. 137; National Science Foundation, "1969 and 1980 Science and Engineering Doctorate Supply and Utilization" (NSF 71-20). Washington, D.C., 1971, p. 26.

TABLE 7

Ratio of Enrollment to Capacity, Fall 1971, in 22 Doctoral-Granting Institutions in New York State

	Full-Time Enrollment	Part-Time Enrollment	Full-Time Equivalent Enrollment
Public (8 insts.)	.70	.87	.72
Private (16 insts.)	.79	.81	.79
Total (24 insts.)	.76	.83	.77

Source: Education Department, Office of Science and Technology, "Survey of Doctoral Capacity and Estimated Doctoral Enrollments," 1972.

about 5,500 places for full-time equivalent students. In the preceding section on projected enrollments, it was seen that annual full-time equivalent enrollments are expected to increase, according to the estimates made by institutions in their 1972 master plans, by not more than 7,200 between 1971 and 1980. These figures are judged to be too high, as noted in that discussion, and a more reasonable figure for the increase in annual enrollment from 1971 to 1980 would be about 5,000. Recognizing all the uncertainties inherent in estimates like these, it nevertheless appears that New York's doctoral institutions have a total present capacity sufficient to meet expected student demand through most of the 1970's. Analysis by subject area indicates that this pattern of expected extended sufficiency of resources obtains in most fields (applied psychology was a conspicuous exception) in both the public and private sectors. While all such estimates are approximate and subject to modification in the reasonably short term, these data do confirm the implications of recent enrollment trends and suggest a policy of restraint in the growth of new doctoral institutions and programs.

4. Doctoral Manpower Needs

The debate about doctoral education in the 1950's and 1960's was centrally concerned with the need to produce skilled manpower for the industry, education, and government. This is still an important factor in all assessments of "need," but additional aspects of need must be considered. These include the need to sustain the expansion and transmission of knowledge in even the most specialized or esoteric fields, the need to develop programs that may contribute to solving societal problems, and the need to develop multidisciplinary and interdisciplinary programs. Although need is generally discussed in the following section in traditional terms of market supply and demand, it is the intention of the commission that the concept of need be broadly considered. This is especially important in view of the rapid shifts in the kinds of advanced training required for jobs as well as in the quantitative needs for doctoral manpower.

Any assessment of manpower needs in New York must be made in the context of national needs because of the high mobility of doctoral holders. On a national scale, the most recent assessments project a significant oversupply or underutilization of new doctorates during the 1970's and 1980's in their traditional labor markets.[10] This trend has already begun, although the problems of unemployment and underemployment are not yet critical in most fields.[11] The most recent assessment of science and engineering doctoral manpower needs in 1980 by the National Science Foundation indicates a surplus of between 18,000 and 66,000 doctorates. They estimate that in engineering, supply will exceed demand by 20 percent; and in the biological sciences and humanities supply will exceed demand by about 10 percent. Only in the physical sciences is a balance of supply and demand expected.[12] Other studies indicate serious oversupply in the humanities and education.[13]

Among employment sectors, the sharpest shift is expected in the academic market, which traditionally has employed over 50 percent of all new doctoral recipients. Surpluses have been experienced in many academic fields for several years. Allan Cartter has estimated that the historic 50 percent employment of new doctorates in colleges and universities will drop to 20-30 percent in the late 1970's, and that by 1986 there will be an actual surplus of college faculty already in place over positions available.[14] (See appendix A for detail.) In the humanities, in which up to 90 percent of the new Ph.D.'s have been entering academic employment, the future is espe-

[10] See, for example, Wolfle and Kidd, op. cit., pp. 784-793; Cartter, op. cit., pp. 132-140; National Science Foundation, op. cit.

[11] National Research Council, "Employment of Ph.D.'s and Postdoctorals in 1971." Washington, D.C.: National Research Council, 1971. Unpublished data on New York State doctoral recipients from National Research Council's Doctorate Records File shows slightly increasing difficulty for New York's new doctoral recipients in gaining employment during the period 1969-71, illustrating New York's close correspondence to national patterns of employment. In the context of probable oversupply, New York, as a traditional net supplier of doctorates to the Nation, can be expected to be a significant contributor to that condition in a number of fields. (See appendix B for first post-doctoral job migration data for New York.)

[12] National Science Foundation, op cit., pp. 5-6.

[13] See, for example, Wolfle and Kidd, op. cit., p. 787.

[14] Cartter, op. cit., pp. 133-136; also F. E. Balderston and Ray Radner, "Academic Demand for New Ph.D.'s, 1970-1990: Its Sensitivity to New Policies" (Ford Foundation Program for Research in University Administration) Berkeley, Calif.: University of California, 1972.

cially bleak. New doctorates in the field of education are faced with an academic employment market in which a contracting student population base now evident in the early elementary grades will be felt most heavily in the higher education community in the 1980's. In a second major employment sector, research and development (accounting for about 25 percent of new doctorates), growth is expected at a substantially lower rate in the 1970's than in the early and mid-1960's, though it is expected to increase from the slow pace of the most recent years.[15]

A National Science Foundation estimate of the shifts out of these two major employment markets in the sciences and engineering (table 8) shows that at least twice as many doctorates will be engaged in some work activity other than in the academic sector or in research and development. These estimates show the end of a period of ready access of doctorates to their traditional major labor markets and indicate that new doctorates will be engaged in activities where new skills may have to be emphasized. Problems of occupational readjustment will be even more pronounced in the humanities. Thus within the context of more limited traditional needs and greater utilization of doctorates in other work activities, even they are increasingly confronted with the prospect of possibly dysfunctional training and of obsolescence.

TABLE 8

1969 and 1980 Utilization of Doctorates in Activities Other Than the Academic Sector and Research and Development

	1969	1980
Engineering	12%	31%-38%
Life Sciences	6%	10%-13%
Mathematics	7%	11%-14%
Physical Sciences	10%	29%-35%
Social Sciences	11%	19%-24%

Source: National Science Foundation, "1969 and 1980 Science and Engineering Doctorate Supply and Utilization," (NFS 71-20). Washington, 1971.

It need hardly be said that projections of need for doctoral manpower have a history of limited accuracy, as do most attempts to predict the future. (A notable exception is the work of Cartter (see footnote 9) who in the mid-1960's foresaw the drop in demand for doctorates in the academic sector.) A number of recent commentators have been critical of projections of doctoral manpower oversupply both in general and in particular fields. The National Board on Graduate Education has cautioned against a policy of overcurtailment of doctoral enrollments in response to manpower projections because of both the unpredictability of needs and the cyclical nature of the supply, demand relationship. A specific example by one author suggests that student enrollment reaction to poor employment prospects in physics has been so great that a shortage of physicists with the doctorate may actually develop later in the 1970's. The widespread sense of oversupply of new college teachers has also been criticized by two authors who suggest that the mechanism of a self-fulfilling prophecy is operating to the detriment of general higher education needs for doctorates.[16]

It is clear, nevertheless, with all these considerations, that while State policy in doctoral education should not be tied too closely to considerations of manpower suppy/demand relationships, at the same time such estimates must be included in overall planning of doctoral programs. It was shown in table 2 how the State's production of doctorates compares to national figures in major fields. As a producer of about 11 percent of the Nation's doctorates, New York must take into consideration its contribution to whatever national oversupply may develop in the future.

Particular note should be taken of the relatively large proportion of doctorates granted in the arts and humanities, fields already identified with especially poor employment prospects. Appreciating all the difficulties and pitfalls in predicting future supply and demand considerations, the data on expected national needs and on New York's role as a supplier clearly suggest a policy of constraint on the growth of doctoral programs. In addition, estimates of future employment patterns suggest that there should be major reassessments of the purposes and content of existing doctoral programs.

C. Patterns of Quality in Doctoral Education

The rapid expansion of doctoral programs and enrollments has been accompanied by concern about both the

[15] Cartter, op. cit., p. 138; National Science Foundation, op. cit., pp. 13-14.

[16] Lincoln Moses, "The Response of Graduate Enrollment to Placement Opportunities," Science, vol. 177, pp. 494-497; T. R. Vaughan and G. Sjoberg, "The Politics of Projection. A Critique of Cartter's Analysis," Science, vol. 177, pp. 139-147. Hans Rosenhaupt, "Woodrow Wilson National Fellowship Foundation Annual Report," for 1969-70, Princeton, N.J.: Woodrow Wilson National Fellowship Foundation, 1970, pp. 5-11; National Board on Graduate Education, "Graduate Education: Purposes, Problems, Potential." Washington, D.C.: National Board on Graduate Education, 1972, pp. 7-10. For an analysis of the cyclical market pattern for doctoral manpower, see Richard Freeman, "The Market for College Trained Manpower." Cambridge, Mass.; Harvard University Press, 1971.

extent of and trends in quality. This section compares New York with the Nation and other major doctoral-producing states and discusses the distribution and trends in quality in New York. This discussion is based on two indexes of quality, the 1969 American Council on Education's ratings of graduate programs and the location of graduate fellowship winners. The American Council on Education assessment is a comprehensive, authoritative peer group rating.[17] The location of fellowship winners is also fundamentally a reputational rating, but more narrowly is how high quality students with substantial financial support "voted with their feet." These data are supplemented by discussion of correlates of graduate quality with various institutional characteristics.

1. New York Compared to the Nation and Other States Graduate Faculty Ratings

According to the ratings of graduate faculties undertaken in 1969 by the American Council on Education, New York has comparatively high quality graduate faculties, as shown in table 9. Ratings in the "strong to distinguished categories" were achieved by 39 percent of the New York programs included in this survey. This compares favorably with the national figure of 31 percent in these top categories. At the low end of the spectrum, 18 percent of New York's programs were given faculty ratings of "marginal or inadequate" in comparison to the 30 percent of all programs nationally placed in these categories.

Further examination of data from this study, however, reveals relative weakness in New York's position. New York had a lower percent of its rated programs in the "strong to distinguished" category (3.0-5.0) than did a number of major or neighboring doctoral-producing states. For example, in contrast to the 39 percent of New York's rated programs in the highest category of graduate faculty quality (3.0-5.0), California had 66 percent of its rated programs in this category; Illinois, 54 percent; Massachusetts, 47 percent; Michigan, 55 percent; Indiana, 48 percent; Wisconsin, 77 percent; Minnesota, 71 percent; New Jersey, 48 percent; and Connecticut, 48 percent. Thus, as measured by this factor, New York has not been as successful in providing a high quality system of doctoral education as a number of comparable states.

TABLE 9

Distribution of Doctoral Programs for Graduate Faculty Quality Rating in United States and New York State

Quality Class	United States	New York State
3.0-5.0 (strong to distinguished)		
number	802	100
percent	31%	39%
2.5-2.9 (adequate I)		
number	467	53
percent	18%	21%
2.0-2.4 (adequate II)		
number	570	56
percent	22%	22%
< 2.0 (marginal & inadequate)		
number	787	48
percent	30%	18%

Source: Kenneth D. Roose and Charles J. Anderson, "A Rating of Graduate Programs," American Council on Education, Washington, D.C., 1970.

[17] Roose and Anderson, op. cit. See appendix C for a critique of this method. Also, at this juncture, the obvious disadvantage of working with data that are at least 5 years old is acknowledged. There are no other comparable, more recent data available, however, and the inherent limitations of the conclusions that may be drawn are appreciated.

Location of Fellowship Recipients

National Science Foundation Graduate Fellows

The choice of institution by winners of National Science Foundation graduate fellowships is an indication of reputational quality in the sciences. New York ranked third among all the states in graduate school choice by National Science Foundation fellowship recipients of 1971. With a production of about 11 percent of the Nation's doctorates in the sciences and engineering, New York attracted 8 percent of United States recipients of the NSF awards, compared to Massachusetts with 23 percent and California with 25 percent. New York was sixth in rank among the 10 major doctoral-producing states in the sciences in the ratio of National Science Foundation graduate fellows to total doctoral output in the sciences in each state. By this standard, New York was relatively less attractive to the National Science fellows than such states as Massachusetts, California, Wisconsin, Illinois, and Michigan. These data are shown in table 10. New York was also significantly less attractive to NSF fellows than neighboring states of Connecticut and New Jersey.

A relatively modest qualitative position in attractiveness in the sciences is indicated, too, by the net outmigration of National Science Foundation graduate fellows between baccalaureate and graduate career stages. New York accounts for a significantly greater number of permanent State residents who receive National Science Foundation fellowships than it does of all United States National Science Foundation fellows who choose to study in New York institutions. New York ranked only sixth out of the 10 major doctoral-producing States in the sci-

ences in the ratio of 1971 National Science Foundation fellows studying in the State relative to National Science Foundation fellows who were permanent State residents. Finally, though New York has over 35 separate doctoral-producing institutions, only four of them attracted 10 or more of the 1971 National Science Foundation national fellowship recipients. These four institutions ranked only seventh (Cornell), 12th (Columbia), 20th (Rockefeller) and 24th (New York University) as institutions attended by the 1971 National Science Foundation Fellowship recipients.

Woodrow Wilson Fellows

The location of Woodrow Wilson fellows is an indicator of reputational quality in the humanities and social sciences. The data in table 10 indicate that New York has been in a relatively stronger position in these fields than in the sciences. Almost 12 percent of the Woodrow Wilson fellows of 1970-71 attended New York institutions compared to less than 8 percent of the National Science Foundation fellows. New York ranked second among the 10 leading humanities and social science doctoral-producing states in the total number of Woodrow Wilson fellows attracted for graduate study in 1970-71. (Massachusetts was first.) In terms of the ratio of fellows to total doctorates awarded in the social sciences and humanities in the 10 leading doctoral-producing states in these fields, New York ranked third (with Illinois) among the 10.

2. Distribution of Quality Within New York State

The graduate faculty ratings of the American Council on Education and the location of fellowship recipients both indicate the extent of concentration of high quality in New York. Trends of the last decade show, according to the council's 1964 and 1968 surveys, a small but definite decrease in the proportion of doctorates produced by the highest rated programs with the prospect that the trend will continue. A 25 percent increase in the number of "new" programs (those rated in 1969 but not in 1964) contributed significantly to the overall drop in proportion of doctorates graduated from and enrolled in the higher rated programs and institutions. At the same time, programs in the State rated in 1969 showed a marked improvement in quality over the preceding 5 years. This improvement in program quality was widely distributed among institutions.

Graduate Faculty Ratings

High quality graduate faculty in the 36 disciplines rated in 1969 were concentrated in eight of the 14 New

TABLE 10

Ratio of National Fellowship Recipients to Doctorates in Same Broad Field in 10 Leading Doctoral-Producing States

National Science Foundation Graduate Fellows (1971)			Woodrow Wilson Fellows (1970-71)		
Ten States Producing Most Science Doctorates (1970-71)	Ratio of Fellows to Science Doctorates (1970-71)	Rank	Ten States Producing Most Humanities and Social Sciences Doctorates (1970-71)	Ratio of Fellows to Humanities and Social Sciences Doctorates (1970-71)	Rank
Massachusetts	.43	1	Massachusetts	.24	1
California	.22	2	California	.12	2
Wisconsin	.10	3	*New York*	*.10*	*3*
Michigan	.09	4	Illinois	.10	4
Illinois	.08	5	Pennsylvania	.09	5
New York	*.07*	*6*	Wisconsin	.08	6
Pennsylvania	.05	7	Indiana	.07	7
Indiana	.03	8	Michigan	.06	8
Texas	.03	9	Texas	.05	9
Ohio	.02	10	Ohio	.02	10

Sources: National Science Foundation, "Grants and Awards, 1971" (NSF 72-7); Woodrow Wilson National Fellowship Foundation, "Annual Report for 1970-71"; National Research Council, "Summary Report, 1971, Doctorate Recipients From United States Universities."

York institutions surveyed.[18] In three institutions, at least 80 percent of the programs rated scored 3.0-5.0 (strong to distinguished) in graduate faculty quality. These institutions were Columbia, Cornell, and Rockefeller. In four additional institutions, about 30 percent to 60 percent of the rated programs were in the highest quality class, and over 50 percent of the rated programs were judged to be 2.5 "good" in faculty quality. These institutions were, alphabetically, New York University, Polytechnic Institute of Brooklyn, State University of New York at Buffalo, the University of Rochester, and Yeshiva.

Location of Fellowship Recipients

The distribution of quality is also indicated by the location of fellowship winners. Table 11 shows the eight leading New York institutions attended by National Science Foundation graduate fellows (sciences), Woodrow Wilson fellows (social sciences and humanities), and Lehman fellows (social sciences) in recent years. Among comprehensive doctoral institutions, it shows a general pattern of concentration at Columbia and Cornell (Columbia especially in the humanities and social sciences and Cornell in the "hard" sciences). New York University and Rochester form a second ranking, followed by the State University at Buffalo, City University of New York, Syracuse, and Fordham. The specialized institutions cited in this ranking were Rockefeller University (sciences), Clarkson (sciences and engineering), and the New School for Social Research (social sciences and humanities). Rockefeller University ranked very high in the number of National Science Foundation awardees it attracted relative to its total enrollment. The distribution of fellowship recipients roughly corresponds to the quality ratings in the American Council on Education assessment.

TABLE 11

Location of Fellowship Recipients in New York Institutions

	National Science Found. Graduate Fellows (1970)		Woodrow Wilson Fellows (1968-70)		Lehman Fellows (Spring 1972)	
Rank	Inst.	No.	Inst.	No.	Inst.	No.
1	Cornell	74	Columbia	99	Columbia	66
2	Columbia	34	Cornell	83	Cornell	35
3	Rockefeller	14	NYU	28	NYU	11
4	NYU	10	Rochester	24	CUNY	8
5	Rochester	4	SUNY Buffalo	22	New School	8
6	Clarkson	2	Syracuse	8	Rochester	7
7	CUNY Graduate Center	2	CUNY	7	SUNY Buffalo	6
8	SUNY Buffalo	2	Fordham	7	Syracuse	4

Sources: National Science Foundation, "Grants and Awards, 1971" (NSF 72-2); Woodrow Wilson National Fellowship Foundation, "Annual Reports" for 1967-68, 1968-69, 1970-71; New York State Education Department, Regents Examination and Scholarship Center.

[18] The 14 rated institutions were Adelphi, Columbia, Cornell, Fordham, New York University, New School for Social Research, Polytechnic Institute of Brooklyn, Rensselaer Polytechnic Institute, Rockefeller University, University of Rochester, St. John's University, State University of New York at Buffalo, Syracuse, and Yeshiva. These ratings should be regarded with several considerations in mind. The ratings exclude many of the doctoral-granting institutions in New York including almost all of those in the public sector. Some specialized institutions offer programs in only a limited number of fields. In some instances, programs rated inadequate appear to exist more in form than substance (judging from enrollment data). With all caveats, however, the ratings do have validity in the assessment of quality in New York. Changes in institutional quality are discussed subsequently in this section of the report.

3. Quality and Institutional Characteristics

High quality graduate departments in New York are concentrated in a relatively few large multiversities and, in some fields, in specialized institutions. High quality programs generally are not found in institutions which have a relatively limited commitment to doctoral education in terms of enrollments and resources. In institutions in the lower half of the quality ratings, doctoral production generally accounts for 5 percent to 7 percent

of total degrees; in institutions in the upper half of the quality ratings, doctorates generally account for 10 percent or more of their total degree output. Comparable differences exist in terms of enrollment distribution.

There is evidence for New York's institutions, as well as for institutions nationally, that quality and efficiency correlate. The four highest rated institutions account for 32 percent of the doctoral enrollment and 40 percent of the degrees attributable to all rated institutions in the State. The middle group account for slightly more of the enrollment (58 percent) than degrees (54 percent). The lowest rated group account for 10 percent of the enrollment and 5 percent of the degrees. These data suggest reduced degree costs on a unit basis in high quality institutions compared to low quality institutions insofar as attrition is a cost factor and insofar as the degree is a standard by which the outputs of graduate education are assigned as cost.*

Data on institutional income correlate high quality with a relatively high percent of total income from sponsored research and from gifts and endowments, and a relatively low percent of income from tuition and fees. With the exception of New York University, institutions in the upper half of the quality rating reported only 15 percent to 32 percent of their income from tuition, while institutions at the bottom of the scale generally reported over 65 percent of their total income from tuition and fees.

Direct Federal support of New York's doctoral institutions also correlates positively with faculty quality ratings in terms of both total obligations and funds for research and development. The top half of the institutions rated for quality in New York accounted for 84 percent of the Federal support (total obligations) received by all rated institutions in 1970. The four highest rated institutions received 27 times more Federal support (total obligations) in 1970 than the lowest rated group of three institutions.

These quantitative correlates of reputational assessments of quality in New York State (and others noted below) conform in general to the analysis of the National Science Board in indicating the institutional attributes associated with quality.[19] Data on correlates of quality in New York institutions and in the national study show the association of quality with a major governmental investment in sponsored research and with a relatively large percent of income from gifts and endowments. They show the association of quality with large numbers of doctoral students in comparison with total enrollment. Also, these data show that programs in related fields at an institution tend to have comparable quality ratings. Finally, there appears to be, in general, a "clustering" of quality at high, middle, or low levels, of most programs at an individual institution. Both national and State data thus suggest a policy of concentration of resource in a relatively few institutions for maximum yield in quality.

4. Trends in Quality

Dilution of Quality in Terms of Production

There has been considerable concern nationally and in the State that the proliferation of new doctoral programs and the greater growth of enrollment in those not of the highest quality has created an overall dilution in quality in doctoral education. The situation is reflected in the National Science Board estimate in 1969 that high quality institutions will decline from 52 percent of national production in 1964 to 34 percent in 1980.[20] Nearly one-third of the United States doctoral production will be by institutions that are "subminimal or otherwise of less than optimum quality," according to this estimate. This projection is confirmed in a recent analysis of Charles Kidd. He estimated that the top 60 universities in the Nation produced 83 percent of the doctorates in 1960; 65 percent, in 1970; and will account for perhaps 55 percent in 1979 under conditions of moderate growth.[21]

This national trend is evident in New York. Analysis of total 1965 and 1970 doctoral output by the rated institutions in each of four quality categories of institution shows a pattern of dilution, as table 12 indicates. It is seen there that institutions in the top quality category increased doctoral output by 40 percent in that 5-year period, while the institutions in the third quality category increased doctoral output by 79 percent.

* While minor distortion in rate of attrition is probable in this comparison because of varying rates of enrollment growth prior to 1970, the lower attrition rates of high quality institutions is documented in Allan Tucker, "Factors Related to Attrition Among Doctoral Students" (Cooperative Research Project No. 1146). East Lansing, Mich.: Michigan State University, 1965, pp. 45-46. In a related aspect of "efficiency" of production, unpublished data from the National Research Council's Doctorate Records File show that the high rate doctoral institutions in New York have shorter registered time averages for their doctoral recipients than do lower rated institutions.

[19] National Science Board, op. cit., pp. 49-108.

[20] Ibid., p. 120. See also Allan M. Cartter, "An Assessment of Quality in Graduate Education" Washington, D.C.: American Council on Education, 1966, pp. 119-120; and Freeman, op. cit., p. 136.

[21] Charles Kidd, "Shifts in Doctorate Output—History and Outlook" (unpublished paper) 1972, p. 8.

TABLE 12

Distribution of Doctoral Degrees Awarded in New York in 1966 and 1971, by Quality Category of Institution (14 Institutions)

Quality Category of Institution	Percent of NYS Production		Percent of Increase
	1965-66	1970-71	1966-71
A	38%	34%	40%
B	27	27	53
C	16	19	79
D	5	5	41
Total Rated Institutions	87	84	51
Unrated Institutions	13	16	90
NYS Total	100	100	56

Source: Kenneth D. Roose and Charles J. Anderson, "A Rating of Graduate Programs." Washington, D.C.: American Counsel on Education, 1970.

In addition, analysis of doctoral output by field in 1966 and 1970 also shows a moderate trend in production toward lower rated programs. Whereas 57 percent of all New York's 1966 doctorates (including those from programs) in the 16 fields examined were from programs rated "strong to distinguished" (in the 1964 American Council on Education Survey), only 52 percent of the State's 1970 doctorates were from programs rated strong and distinguished (in the 1969 Survey). A comparable shift occurred when the doctorates from strong and distinguished departments were compared to doctorates from only the *rated* programs in 1966 and 1970 as shown in table 13. Sixty-four percent of the 1966 doctorates were from strong and distinguished departments, while 60 percent of the 1970 doctorates were from these departments. Thus, there was a decline (exceptions are seen for individual fields) in the State's doctoral production from the high quality doctoral programs in those years. This recent change in New York conforms to the national trends and projections already cited.

TABLE 13

Percent of Degrees From Programs in the Highest Rated Category as a Proportion of Degrees From All Rated Progams in New York

	1966 [1]	1970
Electrical Engineering	89.9%	76.0%
French	74.3%	83.3%
English	83.9%	93.0%
Mathematics	67.5%	61.7%
Chemistry	53.1%	42.2%
Psychology	61.7%	55.2%
History	40.0%	51.2%
Total of Above Fields	66.3%	63.2%
Total of All 16 Fields Rated	63.7%	59.5%

[1] 1966 degrees are correlated with the 1966 ratings and 1970 degrees with the 1969 ratings.

Sources: Allan M. Cartter, "An Assessment of Quality in Graduate Education." Washington, D.C.: American Council on Education, 1966; Kenneth D. Roose and Charles J. Anderson, "A Rating of Graduate Programs." Washington, D.C.: American Council on Education, 1970; NYS Education Department, "College & University Degrees, 1965-66"; Higher Education General Information Survey, Degrees Awarded, 1970-71.

As a matter of general interest, the distribution of doctoral degrees awarded in certain fields in the State among the various quality categories is shown in table 14. Also shown are the most recent enrollments. In most fields the proportion of students enrolled in the lower rated programs is greater than the proportion of doctorates granted in preceding years. This cannot be interpreted generally to mean that a greater proportion of doctorates will be produced from those programs in coming years because lower rated programs are known to be less efficient than higher rated ones in graduating their students. In the few cases where the discrepancy between proportion of degrees granted and enrollment is very great, such a suggestion may be supportable. Unfortunately, doctoral enrollment figures (as opposed to graduate enrollment) only became available in the last couple of years so that long-term trends in enrollment among programs in the different quality categories cannot unambiguously be determined.

Most new programs are not of as high quality as older, established ones. The National Science Board has noted the traditionally long time lags between the beginning of doctoral studies in an institution and the achievement of high quality.[22] This finding is illustrated by data from the American Council on Education Survey which showed nationally that only 6 percent of "new" programs (those rated in 1969 but not in 1964) were adjudged high quality and that 58 percent were considered marginal or inadequate. A similar pattern occurred in New York. Only 11 percent of the 46 programs rated in 1969, but not in 1964, were placed in the top category in faculty quality, while 48 percent of these "new" programs were placed in the "marginal and inadequate" category. In this regard, table 12 is again suggestive, showing an increase in proportion of doctoral production in institutions with no rated programs in 1969. These un-

[22] National Science Board, op. cit., p. 57. Eleven more institutions awarded the doctorate in New York in 1970 than did in 1960.

TABLE 14
Distribution of 1966-70 Degrees and 1971-72 Doctoral Enrollments in 33 Fields According to Quality Class of Graduate Faculty (by Percent)

Field	1966-70 Degrees				1971-72 Enrollment			
	3.0-5.0	2.5-2.9	2.0-2.4	< 2.0	3.0-5.0	2.5-2.9	2.0-2.4	2.0
Biological Sciences	69.9	29.4	2.3	0.4	79.4	17.3	3.3	
Engineering	52.8	36.1	11.1		50.2	31.4	18.4	
Fine Arts (Music)	100.0				100.0			
Foreign Languages	69.6	19.2	10.2	1.0	62.5	29.0	7.6	0.9
Letters	78.5	5.3	13.0	3.2	62.9	8.1	26.6	6.4
Mathematics	64.2	11.7	18.9	5.2	53.4	10.9	28.6	7.1
Physical Sciences	48.4	21.3	22.1	8.2	61.0	12.5	19.0	7.5
Psychology	56.9	19.4	12.2	11.5	32.3	19.9	22.4	25.4
Social Sciences	60.0	11.4	19.0	9.6	47.6	15.6	22.4	14.4
All Fields	60.6	17.9	15.4	6.1	54.1	15.9	20.4	9.6

Sources: Kenneth D. Roose and Charles J. Anderson, "A Rating of Graduate Programs." Washington, D.C., 1970; Higher Education General Information Survey Data on Degrees and Enrollments.

rated institutions increased their doctoral production by 90 percent, while the rated institutions increased production by 51 percent, a possible further source of quality dilution if national trends obtain in New York.

The Improvement of Quality of Programs

Analysis of change in faculty quality in all programs rated in *both* 1964 and 1969, according to assignment to quality categories, shows the margin of improvement over decline is about 6 to 1. Forty-two programs were rated in a higher faculty quality category, while seven programs were placed in a lower category. One hundred twenty-four programs remained in the same quality class. In this analysis, Rochester, Syracuse, and State University of New York at Buffalo showed a dramatic improvement. For these three institutions combined, 26 programs were placed in a higher quality category than in 1964, while only one program was placed in a lower category. None of the 14 institutions had more programs placed in a lower quality category than in a higher category.

The finding of an overall improvement in quality among the more highly rated programs in New York between 1964 and 1969 is also strongly indicated by other data in the 1969 American Council on Education Survey which deals with estimated change in "quality of education." Assessment of this factor involved the opinion of the individual doing the rating as to whether or not an existing program had improved, declined, or remained the same insofar as the "quality of education" it furnished was concerned. Of the 257 programs assessed for change in "quality of education", the ratio of programs adjudged significantly higher in quality to those considered significantly lower in quality was 2.7 to 1 (46 to 17). Only Columbia showed consistent relative decline (though still ranked in the highest quality class in almost all fields), while Cornell, New York University, Rockefeller University, the University of Rochester, and SUNY Buffalo all showed significant improvement.

Examination of trends in quality in New York State thus shows two major trends. On one hand, there was a trend toward dispersion of doctoral enrollments (and eventual doctoral degrees) among more institutions and, overall, toward programs and institutions rated lower in quality. In addition, in New York, as in the Nation, a large number of new doctoral programs of modest, poor, or unknown quality were established in the 1960's. There has been a significant shift in the percent of statewide doctoral enrollments toward these new programs. Thus there has been a trend toward dilution of quality in terms of total State doctoral production.

There is clear evidence that the general movement toward a more widely dispersed and comprehensive doctoral system in New York has been characterized by all overall improvement as well as dilution. This takes the form of consistent improvements in quality between 1964 and 1969 at every level, on a statewide basis, in both public and private institutions. While it is generally true that new programs do take considerable time for achievement of quality, it is also unmistakably true that

in a number of institutions in New York, again both public and private, substantial increases in quality have been achieved in a few years. The evidence is clear that the range of opportunity not only for doctoral study in New York but also for opportunity at high qualitative levels was very substantially increased in the 1960's.

One final point should be made in this discussion of trends in quality. Long established high quality programs are more likely to remain traditional in purposes and methods. The newer programs may have, by virtue of their newness, better opportunity to adapt to needed new emphasis in the training of doctorates. Thus the existence of a number of new programs may be desirable from the perspective of needed increased responsiveness to changing individual and societal needs and in this may lie the greatest opportunity for them to make a unique contribution.

D. Costs and Deficits in Doctoral Education

Central concerns in the debate about doctoral education have been its relatively high cost and the continuing financial stress experienced by doctoral institutions. The following discussion elaborates on these problems in New York's doctoral institutions.

1. The Costs of Doctoral Education

It is very difficult to separate doctoral costs from the total costs at an institution where there is such extensive and intimate sharing of services, activities, and facilities. Procedures are being developed now to a point where there is prospect of general agreement on how this may be accomplished. All parties agree, however, that the costs of doctoral education are high.

In a special study commissioned for this report, David Dresser and David Chapman derived some relationships related to doctoral costs.[23] It must be fully appreciated at the outset that all figures employed are approximate and results obtained from calculations with them are far from precise. Nevertheless, it is believed that they furnish useful guidelines. Dresser and Chapman have estimated the *annual full cost* of a full-time equivalent doctoral student to be 5.45 times the cost of a full-time equivalent undergraduate student and calculated a ratio of 4.08 to 1 for the doctoral *degree full cost* to the bachelor's *degree full cost.*[24] Using these ratios and average costs calculated from the Gradcost Study, it was calculated that for 22 fields combined the average annual full cost per full-time equivalent student was about $7,900 (in 1970 dollars).[25] Taking into account attrition and the varying amounts of time students in the different diciplines are registered for doctoral studies, it may be estimated that about seven times the annual figure, $55,000, represents the average cost of a degree.[26]

The Dresser-Chapman ratios and calculations can also be applied in several ways to illustrate the costs of doctoral education relative to enrollments and degrees. As shown in table 15, doctoral enrollments constituted about 3.5 percent of total enrollments at all higher education institutions in New York State, but following the Dresser and Chapman ratios they represented about 13 percent of the costs of *all* higher education in the State in 1970-71.

Table 16 shows the estimated relative cost of doctoral education in 10 major doctoral-producing institutions. Doctoral level education constituted about 26 percent of educational costs in these institutions in both the public and private institutions. Doctoral enrollment in these institutions accounted for about 11 percent of the total enrollment. If all the medical shcools were omitted from these calculations, the costs attributable to doctoral education would rise significantly, probably above 30 percent.

The dimension of State aid for doctoral education through the Bundy Law is illustrated by the results of the preceding estimates. The $7,900 annual cost in 1970 dollars is $8,500 in 1972 dollars. Assuming that the Bundy aid of $2,400 *per degree* is equivalent to about $400 per year per full-time equivalent student enrolled, it

[23] David L. Dresser and David W. Chapman, "The Finance of Doctoral Education: Resources, Expenditures, Costs and Formulas" (unpublished report prepared for the Regents Commission on Doctoral Education), 1972, pp. 60-76.

[24] Dresser and Chapman, op. cit., p. 68. The ratios for *degree costs* are based on credits per degree and do not consider factors such as attrition. See appendix D for method of calculation.

Sponsored research and student aid are excluded in making these calculations. This was done to make the problem of calculating costs more "manageable." In doing so, many aspects of cost and benefit in doctoral education are disregarded. New knowledge generated by research and the enrichment of a total institution by a viable doctoral program are extraordinarily difficult to measure but are obvious benefits. It is generally conceded that teaching by graduate assistants provides instruction for more students than would expenditure of the same amount of money for a regular faculty member. A discussion of some of these factors may be found in, among other places, Powel and Lamson, op. cit., and Joseph L. McCarthy and David R. Deener, "The Costs and Benefits of Graduate Education: A Commentary With Recommendations." Washington, D.C.: Council of Graduate Schools, 1972.

[25] Powel and Lamson, op. cit., pp. 246-249. See appendix D for cost ranges and medians by field.

[26] In 1968, Allan Cartter estimated that with this assumption the average cost of a degree was about $47,000. In 1970 dollars, that figure is $52,000.

TABLE 15

Estimated Relative Annual Costs of Education in New York State by Enrollment Level

	Full-Time Equivalent Enrollment Fall 1970		Relative Cost of Education [1] (Annual Basis)
	Number	Percent of NYS	
Undergraduate	495,714	85.9	57.5
Master's	46,393	8.0	13.3
First Professional (medical and dental)	6,060	1.1	14.1
First Professional (all others)	8,904	1.5	2.6
Doctoral	19,991	3.5	12.6
NYS Total	577,062	100%	100%

[1] Ratios used to convert full-time equivalent enrollment to cost are undergraduate = 1.00; master's = 2.47; first professional (medical & dental) = 20.00; first professional (all others) = 2.47; doctoral = 5.45.

Source: Enrollment data from NYS Education Department, Bureau of Statistical Services. Weighting ratios from Dresser and Chapman, "The Finance of Doctoral Education." 1972, p. 68. (See appendix D.)

TABLE 16

Estimated Relative Annual Costs of Doctoral Education in 10 Doctoral Institutions [1] in New York State

Control of Institutions	FTE ENROLLMENT			Relative Cost of Doctoral Education [2] (annual basis)
	Number		Percent Doctoral	
	Total	Doctoral		
Public (4 institutions)	43,421 [3]	4,050	9.3%	26.3%
Private (6 institutions)	80,651 [4]	9,105	11.2	25.7
Total (10 institutions)	124,078	13,155	10.6	25.9

[1] Public institutions: SUNY University Centers at Albany, Binghamton, Buffalo (including Health Science Center), and Stony Brook; private institutions: Columbia (including medical and dental schools), Cornell (including medical center), Fordham, New York University (excluding medical center), Syracuse, Rochester (including medical center).

[2] Ratios used to convert full-time equivalent enrollment to costs are undergraduate = 1.00; master's = 2.47; medical and dental = 20.00; other professional degree enrollment = 2.47; doctoral = 5.45.

[3] Public enrollments for 1970-71.

[4] Private enrollments for fall 1971.

Source: Enrollment data for SUNY and CUNY from 1971-72 budget requests; enrollment data for private institutions from 1972 institutional master plans. Weighting ratios for enrollment from David L. Dresser and David W. Chapman, "The Finance of Doctoral Education," 1972, p. 68. (See appendix D).

is seen that about 5 percent of annual costs are met by this grant. This compares with amounts budgeted at public institutions which are variously estimated to range from $3,800 to $5,800 annually per full-time equivalent student. Although aid from public funds for doctoral education at private institutions is certainly modest, the commission does not mean to suggest by this comparison that Bundy aid should equate with the cost subvention at the public institutions. There are other considerations which enter into that problem.

2. Financial Stress in New York's Doctoral Institutions Deficits

All types of institutions have been experiencing financial crisis, but prominent among them are the large private universities which are heavily committed to doctoral education. Nationally, it has been estimated that graduate students account for perhaps 40 percent of the institutional deficits of universities.[27] In New York, the five multiversities (Columbia, Cornell, New York University, Syracuse, and Rochester) awarding about 47 percent of New York's doctorates in 1970-71, also accumulated, by their report, $27 million of the estimated $60 million deficit of all private institutions in the State in 1970-71.

Recent dramatic illustrations of financial stress in doctoral institutions have been the sale of over $74 million in endowment assets and the borrowing of over $50 million to cover deficits in the period 1967-71 by six of the largest private universities, the proposed elimination of major units of New York University, and the up to $3 million annual State subsidy to the Polytechnic Institute of Brooklyn in recent years.

For a number of institutions, the financial future appears troubled. In their 1972 master plans, 22 private doctoral-granting institutions in New York projected through the 1970's a combined deficit of approximately the same magnitude as the deficit for 1970-71. The five private multiversities projected a decrease in their collective operating deficits from $27.1 million to $23.9 mil-

[27] Two major examinations of financial stress on a national scale are Cheit, op. cit.; and Joseph Fromkin, "Aspirations, Enrollments and Resources: The Challenge to Higher Education in the Seventies." Washington, D.C.: U.S. Government Printing Office, 1969, p. 4. Two major examinations of financial stress on a national scale are Cheit, op. cit.; and the Carnegie Commission on Higher Education Report, "The More Effective Use of Resources," op. cit.

lion in 1975 and $22.6 million in 1980. Some smaller institutions projected sharp increases in their deficits during the 1970's. These data are summarized in table 17. The private doctoral-granting institutions collectively estimate that their deficits will decline from 3.4 percent of their total expenditures in 1970-71 to 2.5 percent by 1975. While economies will necessarily be made, other data in the 1972 master plans (notably projected enrollments, tuition charges, and percent of income from tuition), suggest that these expectations of a reduction of deficits proportional to total expenditures may be optimistic. It should be noted that during the past year there has been marked improvement in the financial position of some private universities. Deficits for some institutions have been smaller than expected, partly through improved internal cost controls and partly through increased gifts. However, financial stress is expected to continue in most doctoral institutions.

TABLE 17

Estimated Net Operating Deficits in Private Doctoral-Granting Institutions in New York State (dollars in millions)

Type of Institution	*1971*	*1975*	*1980*
Multiversities	25.8	23.9	22.6
All Others	3.7	5.0	8.6
Total Private	29.5	28.9	31.2

Source: 1972 master plans of private institutions.

In the public sector, where institutions are not permitted to run deficits, the constraints on The City University of New York at the doctoral level are indicated by a reduction in the budgeted cost per full-time equivalent student at the Graduate Center from about $5,700 to about $5,000 (a 12 percent decrease) between 1971-72 and 1972-73. Reductions in estimated unit costs at the graduate level in the State University of New York doctoral-producing institutions in the same 2-year period were about 6 percent.

The Problem of Tuition

A basic income dilemma of private institutions has been that they must constantly raise tuition income to meet rising expenditures. In doing this, they run the increasing danger of pricing themselves out of the market for the most qualified students, not only because of absolute increases in charges but also because of recent increases in the ratio of private charges to public charges. This dilemma is expected to continue. Between 1966 and 1971, tuition charges in the five multiversities increased by about 42 percent. They are projected by these insitutions to rise another 60 percent between 1971 and 1980 to an average of about $4,300.

At the same time that the private institutions are steadily raising tuition, they also expect a steady increase in the proportion of tuition income to total income, from an average of 38 percent in 1970-71 to 42 percent in 1980-81. The five multiversities project an increase in the percent of tuition to total income from 31 percent in 1970-71 to 36 percent in 1980-81. These projections seem optimistic in view of the recent pattern of a *decreasing* percent of income coming from tuition and fees.[28]

The prospect of undergraduate enrollment decline and financial erosion in many doctoral institutions reflects directly on probable doctoral enrollments and quality. Doctoral programs are generally regarded as financially dependent on undergraduate income. In addition, an increasing percent of doctoral students have been dependent on teaching assistantships for financial support in New York. If the private institutions' undergraduate base of support is financially eroded, therefore, doctoral programs may suffer decreased enrollments and institutional support. Such a trend would probably seriously undermine some doctoral programs of high quality and special value.

Student Aid Deficits

One important factor in the financial stress of private institutions is the percent of student aid from institutional operating funds (the student aid "deficit"). Student aid from these sources rose from less than 9 percent of tuition income in 1966-67 to more than 11.8 percent in 1969-70 in the five multiversities (plus Fordham).[29] In effect, the ratio of unfunded student aid increased by 33 percent in 3 years. This problem of constantly rising tuition and decreasing utilization of it to pay operating expenses applies with particular force to institutions that have limited endowed scholarship funds and also to those with a high dependence on tuition income for operating expenses.

The actual costs of unfunded student aid in private institutions are high. For the multiversities (plus Ford-

[28] 1972 Institutional Master Plans; NYS Educational Department, "The Financial Problems of Private Colleges and Universities of New York State. An Interim Report." Albany, N.Y.: NYS Education Department, April 1971, p. 9.

[29] NYS Education Department, "The Financial Problems of Private Colleges and Universities of New York State. An Interim Report." op. cit., pp. 9-10. Also see Cheit, op. cit., pp. 107-108.

ham), the estimated student aid deficits for 1971-72 approximated their combined operating deficits for the year. For this same group of institutions, nongovernment funded student aid rose from $19.6 million in 1966-67 to $29.9 million in 1970-71.[30] For all of New York's doctoral-producing institutions, student aid from operating funds was about $37.2 million (11.7 percent of their total tuition and fee income in 1971-72).[31] While these data apply to all levels of study, a significant proportion of student aid is attributable to doctoral education. Data show that about 20 percent of the 1969-71 doctorate recipients from both public and private institutions in New York held institutionally funded fellowships during their doctoral study.[32]

Student aid is a major means of competing for qualified doctoral students (as well as financing low-income applicants). It is clearly in an institution's interest to give such assistance. Student aid by private institutions also accrues to the State's benefit, however. It is a private subsidy that reduces the costs to the State of students who might have gone to public institutions. Student aid illustrates a way in which private institutions serve public ends not only through the educational process but also by saving public money.

E. Student Access to Doctoral Education

Examination of opportunity for doctoral education for students in New York has a variety of aspects. Student acess pertains to the number of programs offered in the various disciplines and their regional distribution, to standards of admission, to financial barriers for students, and to underattendance by virtue of cultural barriers.

Data already presented indicate that New York has comprehensive resources for doctoral education in terms of number of institutions and of programs in subject areas. The State also has wide geographic distribution of comprehensive doctoral institutions. Data on available capacity in relation to enrollments also indicate reasonable student accessibility to doctoral education, again in most major fields and in most geographic regions of the State. These general findings are supported by additional data on student residence and by data on admission selectivity. However, economic and cultural barriers still exist and do warrant additional examination. The following section briefly discusses data pertinent to problems of access for minority group members, women, and students lacking adequate financial resources.

1. Access for Minority Groups

Racial census data at the doctoral level of study in New York is not available, but full-time graduate enrollment in 1970-71 was reported as only 7 percent racial minority students (the same as for undergraduates) among all the doctoral-producing institutions in New York. This is shown in table 18. Among the minority groups, blacks comprised 3.6 percent of the total graduate full-time enrollment: and Spanish-surnamed students, 1.2 percent. The percent of racial minority students was slightly higher for the private doctoral-granting institutions than for the public institutions. The difference was due to several large private institutions, such as Columbia Teachers College (12 percent minority) and Columbia University (10 percent minority).[33]

TABLE 18

Racial Minorities as a Percent of Full-Time Graduate Enrollment in New York Doctoral-Granting Institutions 1970-71

Minority Group	Public	Private	Total
American Indian	.2	.5	.4
Negro	2.9	4.0	3.6
Oriental	2.9	1.3	1.8
Spanish-Surname	.5	1.5	1.2
Total Minority Students	6.5	7.3	7.0

Source: New York State Education Department, Bureau of Statistical Services.

Incomplete data for 1972-73 show significant increases in minority enrollment. In a sample of 11 private institutions, the full-time graduate enrollment of minorities rose from 7 percent to 12 percent. For blacks, the increase was from 4 percent to almost 7 percent in this sample.[34] Similar trends were evident in the public sector where, as an illustration, there was an increase in black graduate enrollment at State University of New York from 2 percent in 1969-70 to 4 percent in 1971-72.[35] There is evidence that graduate schools have recently been mak-

[30] Commission on Independent Colleges and Universities of the State of New York, "A Plan of Action for Financing Higher Education in the State of New York." December 1971, appendix C.

[31] 1972 institutional master plans.

[32] National Research Council, Doctorate Records File (unpublished data).

[33] These data may slightly underrepresent black enrollment because of inconsistencies in reporting.

[34] NYS Education Department, Bureau of Statistical Services (unpublished data).

[35] State University of New York, Office of Institutional Research (unpublished data).

ing considerable efforts in terms of both admissions practices and financial aid[36] to recruit minority students at the doctoral level. Despite these recent improvements in minority representation in graduate education, great advances are still to be made for full equity in access as illustrated by the fact that in 1970 blacks alone accounted for about 15 percent of New York's 18-24 age population.[37]

Fundamentally, however, low representation of blacks and other minorities in doctoral education proportional to their total population is tied to the serious educational and socioeconomic disadvantages they face at educational levels below the doctorate.[38] Thus blacks accounted for only 6 percent of the college undergraduates in the State and for only 9 percent of the 12th-grade population in the State's high schools.[39] Underrepresentation at all levels of education in New York is even more pronounced for Puerto Ricans. A national study of 1969 high school seniors showed that 61 percent of the Caucasians and 40 percent of the non-Caucasians attended college (37 percent of the blacks and 42 percent of the Spanish Americans).[40]

These educational disadvantages are, of course, closely related to socioeconomic status. In 1969, 20 percent of black families and 30 percent of Puerto Rican families in New York State had incomes below the Federal poverty level, in contrast to the 7 percent of white families in that category.[41] Again on a national scale, studies have shown that 56 percent of black college freshmen were from homes in which parental income was under $6,000, whereas only 14 percent of all other college freshmen came from this socioeconomic background. Over half of the blacks had fathers who had not completed high school, while about a quarter of the nonblacks were in this category.[42]

[36] Heiss, op. cit., pp. 96-98; Mary Ellen Parry, "A Survey of Programs for Disadvantaged Students in Graduate Schools." Princeton, N.J.: Educational Testing Service, 1970; See also J. Scott Hunter, "The Academic and Financial Status of Graduate Students, Spring 1965." Washington, D.C.: U.S. Government Printing Office, 1967, pp. 25, 27, 29, 31.

[37] U.S. Department of Commerce, "1970 Census Advance Report," April 1971. Cited in NYS Regents Position Paper No. 15, "Minority Access to and Participation in Post-Secondary Education." Albany, N.Y.: NYS Education Department, May 1972, p. 6.

[38] Ibid. For comprehensive discussions, see Fred E. Crossland, "Minority Access to College. A Ford Foundation Report." New York: Schocken, 1971; K. Patricia Cross, "Beyond the Open Door." San Francisco, Calif.: Jossey Bass, Inc., 1971; James Coleman, et. al., "Equality of Educational Opportunity." Washington, D.C.: U.S. Government Printing Office, 1966.

[39] U.S. Department of Commerce, op. cit., p. 6.

[40] Cross, op. cit., pp. 114-115.

[41] U.S. Department of Commerce, "General Social and Economic Characteristics, 1970, New York," table 46.

[42] Cross, op. cit., pp. 116-117.

2. Access for Women

New York has granted a consistently higher percent of its degrees to women than has the Nation as a whole. This is true at the bachelor's, master's, and doctoral levels. At the doctoral level, New York grants about 18 percent of its degrees to women, against a United States average of about 13 percent. New York grants a substantially higher percent of doctorates to women than any other major doctoral-producing state. Within New York in 1969-70, the fields in which the greatest proportion of doctorates were granted to women were education (30 percent), fine arts (31 percent), foreign languages (37 percent), language arts (33 percent), and psychology (30 percent). In contrast, women gained an almost insignificant proportion of doctorates in the physical sciences (5 percent) and engineering (1 percent). These data are shown in table 19.

Recent increases in the numbers of women in doctoral education are also shown in table 19. In virtually all fields shown there is a significantly higher percentage of women enrolled in 1971-72 than gained their doctorates in 1969-70. This presages a likely major increase in the proportion of doctoral recipients who are women within the next several years even allowing for the higher attrition rate of women than men. (For comparative data on male-female attrition at the doctoral level, see footnote 44.) Examination of these data by field shows that the relatively low representation of women in doctoral education in New York is especially attributable to low female entrance into the "hard" sciences. Low enrollments in these fields is, no doubt, caused in part by cultural bias in admissions practices, but it also reflects more deeply inculcated cultural biases that discourage women from choosing to enter or remain in these fields.

While the evidence is mixed on the question of sexual discrimination in admissions practices and fellowship awards, Ann Heiss in her study of major graduate schools, flatly asserts that " . . . not excluding academic qualifications, sex is probably the most discriminatory factor applied in the discussion of whether to admit an applicant to graduate school."[43] The Woodrow Wilson National Fellowship Foundation found that while 43 percent of the applicants for Woodrow Wilson Fellowships

[43] Ibid. p. 93. For general data citing the approximate equality of women doctoral students in terms of graduation (at the Ph.D. level) from the highest quality institutions proportional to men, see John K. Folger, Helen S. Astin, and Alan E. Bayer, "Human Resources and Doctoral Education." New York: Russell Sage Foundation, 1970, p. 285. A comprehensive analysis of women who hold the doctorate is found in Helen S. Astin, "The Woman Doctorate in America: Origins, Career, and Family." New York: Russell Sage Foundation, 1969.

TABLE 19

Doctorates Awarded to Women in 1969-70 and 1971-72 Female Doctoral Enrollments in New York State, by Field

Field	1969-70 Doctorates		1971-72 Doctoral Enrollment (Full & Part Time)	
	Number of Doctorates Awarded to Women	% of Total Doctorates in Field	Number of Women Enrolled	% of Total Enrollment in Field
Biological Sciences	41	14.3	617	28.4
Business	2	2.7	34	6.2
Education	189	29.7	1844	36.5
Engineering	3	0.9	40	1.9
Fine Arts	20	31.2	343	49.1
Foreign Languages	45	36.6	594	55.5
Letters	66	28.2	1148	41.5
Mathematics	9	7.6	152	17.1
Physical Sciences	20	4.8	269	10.5
Psychology	64	30.5	817	39.2
Social Sciences	92	19.0	1188	28.5
Total (includes all fields not cited)	600	18.4	7681	28.6

Source: New York State Education Department, "College and University Degrees Conferred, 1969-70." Higher Education General Information Survey, Advanced Degree Enrollments, fall 1971.

were women, only 28 percent of those chosen were women, and attributes this attrition from application to acceptance in part to cultural bias.[44] There is also some evidence that women are discriminated against in the type of support they receive in graduate schools.[45] An extensive national survey of graduate students by the American Council on Education shows that among the group expecting the Ph.D., a slightly higher percent of the women than the men had fellowship support (29 percent to 26 percent), but the men had more sources of support and also significantly higher percent of teaching and research assistantships than the women (43 percent to 37 percent). A slightly higher percent of female than male graduate students relied on their spouse for some financial support (30 percent of the men and 33 percent of the women).[46]

[44] Woodrow Wilson National Fellowship Foundation, "Annual Report, 1970-71." Princeton, N.J., 1971, p. 16. The cultural bias includes consideration of the greater difficulties of women in obtaining jobs commensurate with their training, ability, and interests. The higher attrition rates of female Woodrow Wilson fellows may also be a factor. Of the classes of 1958, 1959, and 1960, 47 percent of the women obtained the Ph.D., whereas 76 percent of the men obtained the doctorate.

[45] See, for example, Heiss, op. cit., p. 94.

[46] See John A. Creager, "The American Graduate Student: A Normative Description" (ACE Research Reports, vol. 5 No. 5). Washington, D.C.: American Council on Education, October 1971, p. 19. See also Folger, op. cit., p. 285; Hunter, op. cit., pp. 31, 33.

3. Financial Barriers to Access

The information is not available to gauge accurately and specifically the extent to which qualified students have been denied access or have faced significantly limited alternatives to doctoral education because of lack of financial support. Anecdotal accounts abound, but are found on both sides of the question. Some information, however, does strongly suggest the need for more support in this area.

First of all, the sharp drop in federally funded traineeships and fellowships (which was more than 50 percent between 1968 and 1972 and significantly greater in the current fiscal year) has not only seriously curtailed access generally, but has placed a special burden on the poor, though qualified, student. One of the major effects of the dramatic expansion of Federal funding of graduate education through both student aid and academic research grants had been greatly to expand opportunities for the talented student without economic resources of his own or his family. This movement toward equality on the basis of ability alone is now threatened with regression.

Second, some idea of the large group of students with limited financial resources in New York is seen from the data of table 20. These data suggest that the group of doctoral students needing substantially increased assist-

TABLE 20
New York State Scholar Incentive Payments; Distribution by Net Income Level

	$2,000	*$2,000-$6,000*	*$6,001-$8,000*	*$8,001-$20,000*
Undergraduate				
1970-71	15%	35%	17%	33%
1971-72	15%	33%	16%	36%
Total Graduate				
1970-71	28%	35%	13%	24%
1971-72	30%	33%	14%	23%

Source: Regents Examination and Scholarship Center, New York State Education Department.

ance in order to remove financial barriers of access may be in excess of one-third of the doctoral student population. In 1971-72, 30 percent of all New York graduate students who received scholar incentive payments had a net taxable income of less than $2,000.[47]

Additional suggestive data on unequal opportunity for doctoral study on the basis of financial barriers is provided by New York's Scholar Incentive system, shown in table 21. The average award to all graduate students in 1971-72 under the Scholar Incentive Program was $331. Advanced graduate students (mostly doctoral) received an average award of $515 (1968 data). The maximum annual award for doctoral students is now $600. This level of support is clearly not adequate to equalize educational opportunity for economically disadvantaged groups. This is especially the case for qualified students seeking to attend private doctoral institutions which have average annual tuitions of over $2,000 and which in some cases charge almost $3,000 annually.

One study has found that 43 percent of graduate students considered financial assistance to be the most important single factor in choosing a graduate school, and 56 percent made their decision about a specific graduate school on that basis. Additional national surveys indicate that doctoral students cite financial difficulties as the single most important reason for not completing study more rapidly or for discontinuing study.[48]

TABLE 21
New York State
Scholar Incentive Payments:
Average Annual Award

	Undergraduate	Total Graduate	First-Year Graduate	Higher Graduate
1967-68	$171		$287	$520
1968-69	$165		$284	$515
1970-71	$178	$317		
1971-72	$207	$331		

Source: Regents Examination and Scholarship Center, New York State Education Department.

[47] On a national scale, the median income of graduate students was about $4,000 and one-half of the single men and women had incomes of less than $3,000 in 1965, Hunter, op. cit., p. 17. The same study shows that the percent of male students with graduate stipends rises with the increase in the father's level of education, job status, and income (p. 35). Thus, support at the graduate level has not been fundamentally apportioned in consideration of socioeconomic equity or probable need.

[48] Cited in Powel and Lamson, op. cit. p. 68; Hunter, op. cit., pp. 42-43, for response on not completing graduate study more rapidly (31 percent of the full-time student respondents compared to 13 percent for the next reason); Creager, op. cit. p. 41, for responses on whether finance will prevent completion of graduate study (9 percent, yes, and 28 percent, maybe, among those students expecting a Ph.D.). It should be noted that recent studies by David Breneman have minimized the role of student financial support in explaining doctoral student attrition and emphasized internal market conditions in institutions and the relative external market for Ph.D.'s as basic factors. See David W. Breneman, "The Ph.D. Production Function: The Case at Berkeley." Berkeley, Calif.: University of California, Berkeley, 1970; David W. Breneman, "An Economic Theory of Ph.D. Production." Berkeley, Calif.: University of California, Berkeley, 1970; and David W. Breneman, "The Ph.D. Degree at Berkeley, Interviews, Placement and Recommendations." Berkeley, Calif.: University of California, Berkeley, 1971. Breneman does not call for an end to student aid, but for the allocation of student enrollments so as to reduce the high attrition of doctoral students.

II. Objectives for the Seventies

The problems confronting doctoral education in New York are systemwide in nature and effects, encompassing all types of institutions, public and private, large and small, complex and specialized. This is true of problems of quality, costs and financing, changing manpower and student needs, and equity in student opportunity. Clearly, therefore, the State has a responsibility to deal with these problems and to promote the orderly development of doctoral education on a statewide basis. The commission believes that all New York's doctoral institutions should be regarded as a system of complementary, interrelated parts. All of New York's institutions should be regarded as distinctive in self-defined missions and purposes but as all working within a common framework.

The commission believes that the objectives for the 1970's in New York's doctoral institutions within a context of common needs, interests, and purposes should be

(A) maximum quality in doctoral education, on an institutional and statewide basis

(B) maximum economy, efficiency, and effectiveness in the use of the resources for doctoral education on an institutional and statewide basis

(C) equity in access to doctoral education for all doctoral students.

It is the major and difficult task of both institutions and the Regents, as the State's coordinating body in higher education, to work toward these objectives to the greatest possible extent through judicious programs of coordination and selective use of resources. It should be the objective of all concerned to make progress toward these objectives as complementary and as mutually reinforcing as possible on a statewide basis In a period of constraint and consolidation, moreover, emphasis should be placed on maximum effectiveness in the use of resources on a statewide basis. Of course, institutional diversity, flexibility, and initiative should also be sustained in this process as much as possible.

The following section discusses approaches that the commission believes appropriate to pursuit of the several objectives. It is expected that these approaches should be multipurpose, such as supporting the objective of increased efficiency as well as quality, or increased student opportunity as well as net economy.

A. Maintaining and Improving Quality

A central objective in doctoral education should be the maintenance and improvement of quality. There are great ambiguities and subtleties of concept surrounding quality.[49] But quality does exist, and it needs no defense as a goal. Quality should be a basic determinant in the allocation of resources in doctoral education. Thus its assessment, however difficult, is of central importance. The following discussion indicates some of the factors and methods the commission believes important in the assessment of quality.

1. Assessments of Quality

It is clear that assessments of quality must be responsive to the mix of objectives of each program being evaluated. Some may be geared primarily to the production of new knowledge, some primarily to the application of knowledge to solving technological and societal problems, and others primarily to the training of skilled teachers.[50] As the objectives vary in relative importance, so too must the criteria used to judge success in meeting the defined objectives. In addition, all evaluations must be sensitive to the environment of free inquiry characteristic of high quality programs.

Evaluation by Peer Groups

The commission believes that evaluations by external peer groups best assess the appropriateness of program objectives and the effectiveness with which they are being met, as well as the less tangible milieu and "climate" of quality. Such groups should include both aca-

[49] Allan Cartter has noted, for example, that ultimately quality is an "attribute of value" and cannot be objectively measured. Cartter, op. cit., p. 4.

[50] The purposes of graduate education are discussed, for example in the National Board on Graduate Education, op. cit., pp. 3-6. For additional discussion and critique, see Heiss, op. cit.; Bernard Berelson, "Graduate Education in the United States," New York: McGraw-Hill, 1960; Clark Kerr, "The Uses of the University." New York: Harper and Row, 1963; Stephen M. Spurr, "Academic Degree Structures," New York: McGraw-Hill, 1970; and McCarthy and Illner, op. cit.

demic and nonacademic members and recent doctoral graduates. They should of course assess a program both through appropriate statistical indexes of quality and also through extensive interviews and discussions with students, recent graduates, faculty, and administration. The peer groups should examine the various aspects of program effectiveness and success within the context of the defined objectives of a program. The factors to be considered include supportiveness of graduate students; quality of informal and formal advisement and supervision; degree of cooperation, morale, and commonality of purpose among both students and faculty; effectiveness of teaching; student quality; institutional support for doctoral programs; comprehensiveness of instruction; coherence of programs within a department; and supportive facilities. A major aspect of these peer group evaluations should be examination of the quality of the outcomes of the doctoral program as indicated by the quality of student research and dissertations and by faculty research (or other creative achievement). Evaluations should also attempt to assess quality in terms of how fully a program has utilized or developed student ability and in terms of how the students have been changed or affected by the educational process.

The commission feels that evaluators should particularly assess the responsiveness of each program to changes within the methodology and structure of knowledge in each discipline. They should assess the responsiveness of programs to the problems of the rapid obsolescence of specialized knowledge characteristic of some fields. As is appropriate in the various disciplines, they should assess each program's responsiveness both to need for increased or changed specialization and also to needs for more interdisciplinary training. In sum, evaluators should examine not only the effectiveness with which a program's stated objectives are met but should also assess each program's objectives in the context of changes within the discipline being examined.

The commission believes that evaluators should also be sensitive to changing work roles and activities in each discipline and to problems of possible mistraining and misutilization of Ph.D.'s. Clearly, only a limited number of programs fully committed to producing university research professors will be needed. There should be readjustments in values and purposes among graduate faculties so as to prepare doctoral students more adequately for changing work roles. Evaluations by peer groups should assess responsiveness to new needs. These include more generalized, cross-disciplinary analysis and more sophisticated, problem-solving capabilities. The "consumers" of doctoral education especially — the students, alumni, and employers—should be assayed as to the effectiveness of the program being examined in preparing students for work, both in terms of needed skills and knowledge and in terms of attitude toward different roles they will assume.

2. Efficiency and Quality

The commission believes that in a period of limited resources there must be increasing examination of the efficiency and productivity of doctoral programs. The discussion of quality in New York's institutions has noted that the high quality institutions generally are more efficient in doctoral production than low rated institutions. Analysis by the National Science Board shows that high quality institutions have higher graduate student/faculty ratios and grant more doctorates per faculty member and per graduate student than low quality institutions.[51] Programs characterized by both efficiency of production and high quality should be strongly supported wherever they exist.

Programs should be carefully examined for low efficiency and productivity, using such indexes as number of students and degrees granted, attrition rate, alumni productivity (as indicated by job placement, employer satisfaction, research achievement), and student and faculty research (or creative achievement). Programs of low quality accompanied by low efficiency or productivity should be considered for phasing out. It must be emphasized that efficiency should not replace other indexes of quality, but it should be considered in the larger context of relative benefit and need to both the institution and society.

3. Size and Quality

An increasing body of information shows the general correlations of size and quality. The National Science Board in its study of correlates of quality has found, for example, that high quality doctoral institutions have larger degree outputs, a higher ratio of doctorates to baccalaureate degrees, larger departments (in terms of faculty members), greater educational and general income, and greater Federal funding for academic research and development than low quality institutions.[52] High

[51] National Science Board, op. cit., pp. 77-81, 92-97. The *total* student/faculty ratio was lowest in the high quality institutions and increased with the decline in quality class of institution. The National Science Board notes that low student/faculty ratios might be expected in new high quality programs which had not yet achieved widespread repute among potential graduate students.

[52] National Science Board, op. cit., pp. 53-65.

quality institutions characteristically have a number of high quality programs in related fields. The National Science Board has suggested as a "critical mass" minimum for doctoral institutions, seven doctoral programs in mutually supporting fields, of seven faculty members and 49 students each.[53] These kinds of data and analyses suggest giving support to a general resource concentration policy in the State's system of doctoral education.

Thus the examination of quality has a variety of aspects and ramifications. Assessments should be sensitive to the diversity of professional and social roles for which doctoral education prepares students. Within this framework, evaluations of quality should centrally examine the extent to which doctoral programs fulfill their stated objectives. Beyond this assessment, however, evaluations should consider the degree to which programs are preparing students for changes in both their discipline and in kinds of work activity. In addition, evaluations should assess quality in relationship to various factors of efficiency. These several considerations should be a basis on which to establish priorities of relative benefit and need and on which to allocate resources for the support of doctoral education.

B. Increasing Economy, Efficiency, and Effectiveness

A second major objective of State policy in the 1970's should be utilization of New York's total resources for doctoral education in a more economical, efficient, and effective way. This means the reduction of unnecessary duplication and competition in the State's system of doctoral education. It means maximizing such desired attributes of doctoral education as high quality and increased student opportunity in the most economical and efficient way while at the same time maintaining the pluralism and diversity of New York's system. It means, finally, making the State's resources for doctoral education more effectively responsive to societal and individual needs.

Approaches to realizing these objectives may be discussed within three categories which are mutually supportive. They are (1) reviews of program need, benefit, and purposes (2) development of interinstitutional cooperation and coordination, and (3) selective financial support for doctoral programs.

1. Reviews of Program Need

Because education has entered a period of constraint in growth and resources and because of changing societal and individual demands, it is imperative that there be systematic reviews of need, benefit, and purposes in doctoral programs. These assessments from the broad perspective of need should mesh with the assessment of quality discussed in the preceding section. Reviews should occur on two levels. The first is within the institution itself and the second at the State level.

Institutional Self-Evaluation

All doctoral programs should be self-evaluated by institutions in terms of both institutional needs and priorities and in terms of societal needs for doctorates in the discipline. These internal reviews may be appropriate at various levels. They may be universitywide, or as in the case of State University of New York and City University of New York, systemwide.

It is apparent that some doctoral programs are excessively costly in terms of benefits to the institution or students. The faculty may be too small or the students too few for an effective program. There may be inadequate quality of students or faculty, or poor productivity and achievement. There may be inadequate specialized supportive facilities, notably libraries or equipment for scientific research. A program may detract significantly from the quality and effectiveness of undergraduate work in the same field. A program may not contribute to or enhance doctoral programs in other disciplines in the institution, but instead, by virtue of unusually high cost, seriously weaken them. In addition, institutions should evaluate their doctoral programs in the context of existing strong programs in the field in the State and Nation. If the program is comparatively weak, serious consideration should be given to either raising it to high quality or else eliminating it and using its resources elsewhere.[54]

Special consideration should also be given to the future of all fields examined in the context of scientific and scholarly trends and in terms of national needs. Although doctoral education cannot be geared exclusively or even primarily to employment preparation, institutions should, nevertheless, be increasingly sensitive in their evaluations to the degree to which these programs are responding to changes in employment patterns. As in external reviews of quality, doctoral programs should be

[53] Ibid., pp. 97-102.

[54] The Carnegie Commission on Higher Education in "The More Effective Use of Resources" (1972) discusses such institutional reviews, especially pp. 91-110. Problems of resource allocation are analyzed quantitatively in a number of the studies emanating from the Ford Foundation Program for Research in University Administration. For two examples of procedures and criteria for institutional self-evaluation of programs, see appendix C.

examined by institutions themselves in terms of whether they are making their students increasingly vulnerable to changes in their discipline or the job market and whether they are training them to deal with broad functional problems and interdisciplinary problems.

The effect of such internal reviews of doctoral programs in terms of quality, costs, and benefit to the institution and society should result in a more effective and efficient internal structure of doctoral education at a higher level of quality.

Statewide Review and Coordination

As the body responsible for the development of higher education on a statewide basis, the Regents should both intensively and systematically review programs and vigorously exercise their coordinating function in the interests of maximum overall economy, efficiency, and effectiveness. As the only agency at the State level with cognizance over all New York's education institutions, they should insure that duplication is avoided, that needed areas are served, and that an increasingly interrelated system develops. To this end, they should rigorously assess proposed new programs in the context of existing regional State, and national programs in the same field according to standards of both need and quality. In assessments of quality in existing programs, the Regents, like the doctoral institutions themselves, should examine each program's contribution to both societal and institutional needs. Finally, the Regents should undertake a systematic study of the economics of doctorate production in New York's doctoral institutions in order to ascertain the actual and relative cost of doctoral education among institutions and disciplines. Analysis along this line should contribute greatly to the more efficient and economical allocation of resources.

2. Developing Interinstitutional Cooperation and Coordination

Interinstitutional cooperation and coordination hold great promise for promoting all of the commission's recommended objectives for the seventies. Sharing facilities and faculty and providing for cross registration of students, for example, are obvious ways of extending the benefits of high quality resources as well as minimizing unnecessary duplication and competition and probably saving money. A special study prepared for this report avers that ". . . At issue in this study is not so much whether joint efforts among colleges and universities can or should exist (the lengthy history of, and increasing experience with, various forms of interinstitutional cooperation has clearly answered this the affirmative), but rather for what purposes, under what conditions, and in what forms might such combinations be most effective?" [55] The commission concurs in this outlook and believes that purposeful ventures in coordination and cooperation will contribute importantly to increased quality, student opportunity, and efficiency.

Interinstitutional cooperation may proceed in a variety of forms. It may develop between graduate departments in the same disciplines, in complementary disciplines, or between institutions with mutual interests. It may develop regionally, on a statewide basis, or on an interstate basis. It should occur within formal and informal groupings. Encouragement and stimulus should be given to all forms of cooperation that promote the objectives of State policy in doctoral education. There may be a special opportunity for cooperative efforts within the framework of regional programs now being established.

The possible forms of cooperation can be categorized in many ways. In the paper prepared for this study, the authors have categorized major forms: (1) instructional forms and techniques (particularly in technology); (2) joint degree programs; (3) faculty sharing; (4) student exchange; (5) student research (field experience); (6) service and applied expertise; (7) facilities sharing; (8) faculty development; (9) faculty research.

The authors of this paper suggest that all nine of these categories of coordination at the doctoral level might apply under the assumptions, clearly applicable to the Regents, that (a) the coordinating agency plays a strong or moderate role, (b) there is a State policy of maintaining a balance between private and public institutions, (c) there is a strong coordinating agency commitment to quality.[56]

Some forms of interinstitutional cooperation are clearly more readily effected than others, in large part because of a low perceived threat to the autonomy or basic interests of institutions or affected groups within institutions. Thus, facilities sharing and student exchange can be relatively easily implemented. Facilities sharing is also likely to result in cost savings by participating institutions. Other forms of cooperation, such as joint degree programs or sharing of institutional techniques and forms, might be more difficult because of high perceived threats to interests within institutions. Whatever the uncertainties and difficulties, however, it is clear that interinstitutional cooperation can and should be an important means of increasing the total effectiveness of New York's

[55] Peterson and Woggett, op. cit., p. 1.

[56] Ibid., pp. 18-26. See appendix E for a more detailed presentation.

system of doctoral education in meeting its needs and responsibilities.

3. Financial Support for Doctoral Programs

The commission believes the State's commitment to doctoral education must be accompanied by the willingness to provide sufficient resources and opportunity for it to sustain itself in a productive and efficient manner at a high level of quality. Its support of programs in the public sector is direct and straightforward through the usual budgeting process and appropriations by the Legislature. Contributions of public moneys to programs in the private sector are made through direct grants, under the Bundy Law, to individual institutions for each degree granted.* While the commission recognizes the many questions surrounding the issue of disbursement of public moneys to a mixed public and private educational enterprise, it strongly believes that appropriate support should be provided for high quality and needed programs in both sectors.

It should be reemphasized at this point that it is in the State's interest to maintain continuation of programs of high quality because quality and efficiency are mutually reenforcing. As noted in the discussion of the correlates of quality, the highest quality institutions are often also the most efficient, producing more doctorates per faculty member and per graduate student than lower quality institutions. Additionally, the National Science Board has found that the unit cost of raising quality is least at the top end of the scale.[57] Thus, it would generally be more economical for the State to sustain high quality in established programs than to attempt to raise quality through large investments in low quality programs. It should also be noted that high quality programs are generally most successful in attracting funds from external sources. All these considerations apply both to public and private institutions.

Although calculations of the costs of doctoral education within a university are still not developed to the point where precise figures are available, there is considerable evidence that the amounts formally budgeted in the public sector do not really cover actual costs. The estimate of about $8,500 (Section I D) as the average annual cost for doctoral education per full-time equivalent student does not square with the annual budgeted allocations at public institutions variously cited from $3,300 to $5,300, with more weight given the lower figure. (Comparable figures were not readily available from the private sector.) The difference must be made up by funds from tuition, sponsored programs, or other sources. If this is achieved, the full educational costs will be forthcoming. If this is not achieved, then the doctoral program will suffer or support will be drawn from other levels of instruction. There appears to be evidence for the latter in both the public and private sectors. To the extent that is so, a poor atmosphere is provided for sustaining the kind of doctoral education enterprise to which the State aspires, to say nothing of the effects on other levels of instruction.

The State and New York City in its relation to The City University have the responsibility to insure that the doctoral programs in the public institutions meeting the standards of present or potential high quality and need receive appropriate support. They have an important place and serve important functions within New York's overall educational system. Having made a commitment to establish this level of education in the public institutions, it is vital that the State and city see to it that the qualified programs are maintained to achieve the goals set for them. With probably many, if not most, programs still in relatively early stages of maturity and growth, and during a time of diminishing support from traditional sources, particular attention and discrimination are required to concentrate available resources for doctoral education most appropriately.

The State and city also have a considerable stake in the continuation of programs of high quality and need in the private sector. Generally speaking, it would be more expensive for them to provide additional doctoral education for more students at public institutions than to subsidize their education at private institutions. Thus, a program of increased Bundy aid support for doctoral education, within the limits of the subvention with public funds for support of doctoral education at public institutions, should promote net efficiency and economy in New York's system of doctoral education. Under the present formula, $2,400 is granted for each doctorate awarded. This represents, on the average, about one-twentieth of the estimated actual cost of each degree.

The commission is aware of the many questions of both principle and pragmatism surrounding the application of the present formula for Bundy aid. The formula does not, for example, discriminate among programs or institutions on the basis of such factors as quality, resources, level of sponsored research, student aid, or instructional practice. Neither, insofar as can be deter-

* Public funds also accrue to private institutions through such programs as the Regents Scholarships and Student Incentive aid wherein awards made to individual students are used for tuition payments at the institution, public or private, the student attends.

[57] National Science Board, op. cit., pp. 108-113.

mined, do appropriations to individual institutions in the public sector so discriminate. As has already been stated, the commission believes that public funds should be appropriated to support discriminately doctoral education on the basis of high quality and need.

C. Toward Equity in Access

A third objective of State policy in the 1970's should be to provide equal opportunity for doctoral education to all qualified students at all the institutions, both public and private, within the State. Full realization of this goal should not be frustrated by socioeconomic or cultural barriers.

1. Reducing Economic Barriers

Financial considerations may be the most pervasive barrier to access. While data are not available on the number and quality of students excluded from doctoral education by lack of financial resources, a substantial number of doctoral students and qualified potential students do lack adequate financial resources. The problem of financial barriers has been both illustrated and exacerbated by the decline in public fellowships, traineeships, and assistantships support for doctoral students. Whereas Federal fellowships and traineeships, which had effectively reduced financial barriers for science students in the 1960's, supported 20 percent of United Stated graduate students in 1968-69, by 1972-73, they supported only 7 percent of the graduate students.[58]

The problems of inadequate student aid have had major impact on students' opportunity to attend the private universities where tuitions are higher than at the public institutions, and where the traditional sources for their support are much diminished. The commission believes that if the objective of equal opportunity for admission of qualified students to any of the doctoral programs in the State is to be realized, then a student grant based on the difference in tuition at the public and private institution and on the students' individual need should be forthcoming.

This is probably best accomplished through the State's Scholar Incentive Program, modified to accomplish the objective described here. In devising formulae for enacting this recommendation, however, these grants for narrowing the public/private tuition gap, should not, when coupled with Bundy aid to the institution, exceed the limits established by the cost subvention for doctoral education at the public institutions. At the same time, care should be taken that support for achievement of equity in access should not become a stimulus to great doctoral enrollment expansion.

It should be emphasized that increased public support of doctoral students is desirable for reasons of general economic benefit. Estimates of the "costs" of doctoral education frequently underestimate both the costs to the student and the economic contributions of doctoral training to society. All commentators agree that in addition to the actual costs to the student of tuition and subsistence, earnings foregone while in graduate school must be counted. It is also estimated that most, if not all, of the public cost of education at the doctoral level is paid back through the higher taxes resultant from the higher income attributable to the doctorate. There are, of course, additional benefits accruing to society from the existence of doctoral education and manpower in the form of new knowledge, economic development, and other less tangible dividends.[59] Clearly, substantial support of doctoral students is a judicious public investment.

2. Removing Barriers to Minority Groups and Women

In its first report, the National Board on Graduate Education makes the observation . . . "The overwhelming majority of faculty members in the United States are white males. It is unlikely that this accurately reflects the distribution of talents required for teaching and research in the population." [60] In view of the fact that the doctorate is a general requisite for faculty membership, it appears a safe assumption that whatever the reasons, this is a reflection of what had transpired in past years in graduate schools.

Although representation of minorities and women in doctoral studies is increasing, they are still underrepresented. As already noted, in 1970 women accounted for only 29 percent of the doctoral enrollment in New York and minority members for less than 10 percent (blacks for less than 4 percent). Although there are some findings to the contrary, the evidence appears to be predominantly on the side that women indeed have been subject to significant discrimination in gaining access to doctoral studies in certain fields and in certain institutions.

[58] Kidd, "Federal Support for Graduate Education in the Seventies," op. cit., p. 12.

[59] For a discussion of costs and "return" on investment, see Freeman, op. cit., especially chapters 5 and 6, and Powel and Lamson, op. cit., especially chapter 2.

[60] National Board on Graduate Education, op. cit., p. 14.

In the case of minorities, there is evidence that at present discrimination in admission to doctoral studies is not the significant factor it once was. Low minority representation in doctoral studies at this time probably derives most importantly from low income and the serious disadvantages minority group members still face at educational levels below the doctorate.

Whatever the deep-seated cultural and socioeconomic barriers causing disproportionately low minority enrollments, affirmative action measures should be taken by both institutions and the State to increase enrollments of qualified students in these groups in doctoral programs. There should be a continuing examination of the admissions practices, enrollments, and attrition rates of these students to insure equity in access and responsiveness to the special needs of these groups. The State should also promote, through affirmative action programs, thoroughly equal employment opportunities for minority members and women as staff members in doctoral institutions or others requiring doctorates.

III. Recommendations

A major theme of this report is the need for New York to coordinate its planning for doctoral education at the State level. This recommendation derives its force from the fact that this is a period in which the resources available for doctoral education are clearly limited and promise to remain so in the foreseeable future. Consequently, the traditional practice of individual institutions seeking to develop their own comprehensive doctoral programs, often in fierce competition with each other, can no longer be justified. The present situation requires that future development of doctoral education in the State be guided by the principle that doctoral programs should complement one another so that their quality and purposes are mutually supportive to the greatest extent possible. The arrangement of higher education in New York in three separate sectors, State University, City University, and the private institutions, make this even more essential.

The commission makes its specific recommendations in cognizance of the Regents mandated responsibility to coordinate planning for all higher education in the State, both in the public and private sectors, and their authority to accredit programs to all the institutions and to evaluate eligibility for aid to private institutions under the Bundy Law. It is noted in this regard that the Board of Regents possesses virtually all the characteristics and functions cited by the Carnegie Commission on the Future of Higher Education as appropriate for a statewide higher education coordinating and planning agency.

Finally, the commission takes note of the richly diverse array of doctoral institutions and programs in the State in both the public and private sectors. The national and indeed international standing and roles of many of them should not be devalued by the recommendations for statewide coordination and planning.

Recommendations

(1) *The Regents should regard all the doctoral programs at both the public and private institutions, as constituting together an interrelated system for doctoral education.*

The commission considers this recommendation to be fundamental. Doctoral education faces an abundance of complex problems at this time, and its purposeful coordination at the State level is essential if New York is to preserve and strengthen its position in this vital area of higher education.

The Regents, as the responsible agency at the State level for coordinating the planning of higher education, should take steps to insure that all the State's doctoral programs, individually and collectively, are of the highest quality, that they are pursued with economy and efficiency, and that socioeconomic and cultural barriers to access are eliminated. The other recommendations of the commission are directed essentially toward the realization of these goals.

(2) *The Regents should have a general policy of concentrating programs at a relatively limited number of institutions in the interest of both highest quality and the most efficient and economical use of limited resources.*

An increasing body of information indicates that both high quality and economies of scale are generally found in institutions which have a major commitment to doctoral education and which have substantial programs in related fields. The advantage of mutual support of related programs wherein their physical and financial resources and the interests, knowledge, and competencies of faculty and students are shared is best realized by concentrating these programs at a relatively limited number of institutions. At the same time, in a state as large and diverse as New York, due consideration must also be given to regional needs.

(3) *The Regents should establish special committees to review the quality of and need for doctoral programs in selected disciplinary areas. Only programs meeting standards of present or potential high quality, and need should be offered.*

This recommendation stresses the paramount importance of quality and need in doctoral education. Only programs meeting standards of high quality and need should be sustained. Even those programs which heretofore have been regarded as being of sufficient quality re-

quire serious review at this time of limited resources and new estimates of need. However difficult and challenging a task this recommendation presents, the problems it addresses must nevertheless be faced.

The commission recommends, *first*, that the Regents appoint evaluation committees in the disciplinary areas they wish to study and charge them with evaluating the programs according to specified criteria and procedures. The commission believes that evaluations are ordinarily best made by groups composed primarily of peers in the disciplinary area. These peers should be primarily from out-of-state, represent both the academic and nonacademic sectors, and include recent doctoral graduates.

The committees should employ combinations of objective and judgmental criteria in making their evaluations. The criteria should reflect the joint requirements of high quality and need. Among the specific factors that must be considered are quality of students, scholarly achievement of faculty, availability of laboratory and library facilities, success in graduating enrolled students, financial support, the supervision and guidance of students, and the need for each program and its appropriateness for students' career aspirations.

Within the context of this report, "need for programs" has several connotations. It includes the need to sustain the expansion and transmission of knowledge in even the most esoteric fields; the need to produce skilled manpower for employment in industry, education, government, or other sectors; the need to develop understanding and methodologies that may be used to deal with societal problems; and the need for new forms and types of programs in doctoral education. The evaluative procedure should give weight to these several aspects of need according to the special character of each discipline. Assessments of need should be made on regional, statewide, and national bases, again according to the special character of each discipline.

Consideration of the "appropriateness of programs for students' career aspirations" has generally not been emphasized enough in the evaluation of doctoral programs. The practice in most fields has been primarily to prepare doctorates for research oriented careers in universities. The sharp contraction of the academic market and consequent greater likelihood of employment in other sectors and in new kinds of work activity necessitate much closer examination of the purposes and processes of doctoral education.

The commission recommends, *second*, that on the basis of the committees' reports and recommendations, the Regents should give consideration to which programs should be sustained, placed on probation, or in case of serious deficiency, deregistered. Probation of a program should be for a period of 3 years, at the end of which time its status should be reviewed. The question of withdrawal of registration presents difficult and painful problems for all concerned. When a program that fails to meet standards has been identified, the commission recommends that the Regents, in consultation with the institution affected, arrange for its phasing out over a reasonable period of time with due consideration for the faculty and students involved.

The particular statewide evaluations recommended here are envisaged as part of the current special reexamination and reevaluation of doctoral education in the State. The commission recognizes, of course, that the regular review of programs to maintain standards in all areas of doctoral study is the continuing task of the State Education Department. The commission recommends that the Department take the same actions proposed here with regard to support and registration of all doctoral programs on the basis of their review and assessment.

(4) *New York State should lend its financial support in both the public and private sectors only to programs meeting the standards of existing or potential high quality and need. Programs without these qualifications should not be supported.*

The commission believes it is essential that financial support of programs by the State be provided selectively on the basis of quality and need. At a time when resources are constrained and when review and reevaluation are watchwords in doctoral education, the State should not expend resources on programs which do not meet standards of high quality and need. These funds would be much more effective if reallocated to the support of those programs that do meet such standards.

The private institutions' main source of State funds is Bundy aid. Present practice calls for awards to be made for doctoral degrees granted from all registered programs. The commission recommends that awards be made only for degrees granted from individual programs that meet the standards determined by the Regents. Programs on probation would also warrant support.

The commission also recommends that financial support for doctoral education in the public institutions be given only on a selective basis to approved programs. In addition, the present funding formula for doctoral education in public institutions, which rests on enrollment, should be modified to incorporate a factor based upon awarded degrees. It is urged that the Legislature and

Governor authorize funds for support of only those programs meeting the standards of high quality and need.

(5) *New York State should strengthen its support of all programs that meet the standards of high quality and need.*

This recommendation is advanced in recognition of the need for the State to make an unqualified commitment to support its high quality and needed programs in doctoral education. Such programs are found in both the public and private institutions. Many of these institutions are national and international research centers, drawing talent and money to New York, enhancing its economic development, and making available their many resources and talents for use by industry and government.

The commission recommends that the programs at the public institutions meeting the standards of quality and need be adequately supported. The selective funding of only such programs as these, as called for in recommendation (4), would allow for the concentration of resources to increase their support. It is strongly recommended that the State and city make a commitment to insure that the programs in their institutions meeting the standards of quality and need that have been developed are sustained with adequate support. It is urged that the Legislature and Governor authorize these funds.

Programs of quality and need should also be supported at New York's private institutions. They historically have produced most of the State's doctorates and will continue to do so in the foreseeable future. In view of their importance to doctoral education in New York, the commission believes that the level of Bundy aid could be doubled from the present level ($2,400 per degree, or approximately $400 per year per FTE student) without raising serious questions of its being disproportionate to the State's and city's subvention of doctoral programs in public universities. The award of Bundy aid only to qualified programs as called for in recommendation (4) would allow for the concentration of resources in their support.

(6) *The Regents should sponsor increased cooperation and coordination in doctoral education by the institutions within the State.*

In order to design and promote purposeful interinstitutional cooperation in as many ways as possible, the commission recommends that the Regents direct the establishment of committees of representatives in the various disciplinary areas from the State's doctoral institutions. The commission believes that each committee should be given a specific charge and be required to submit a report of its efforts. This system of committees should provide opportunities for both public and private institutions to achieve improved quality, economy, and student opportunity. This cooperation may proceed on a variety of levels—between individual institutions, regionally, statewide and interstate—as the best opportunities may appear.

(7) *The Regents should insure that doctoral education at all institutions within the State be accessible to all qualified New York students. Economic and cultural barriers to the realization of this goal should be eliminated.*

This recommendation has a number of facets, but its essence is that access to doctoral education must be equally available to all qualified students at all the institutions, both public and private, within the State. The commission recommends that the Regents insure that economic and cultural barriers do not prevent the realization of this goal.

In furtherance of this objective, the commission recommends that differences in tuition between the public and private institutions be considered to prevent this economic factor from limiting students' range of opportunities for doctoral education. The financial grants to be provided New York students in such a new program to achieve this objective should be based on need. In devising formulae for this purpose, however, these grants should not, when coupled with Bundy aid to the private institutions, exceed the limits established by the public cost subvention for doctoral education at the public institutions.

In addition, the commission recommends that sex and minority group membership be eliminated as barriers to enrollment in doctoral programs for qualified students. The Regents are urged to continue their efforts to insure that women and others heretofore excluded by those barriers have full opportunity to secure doctoral education so that they may subsequently participate more widely in society in all those activities requiring such preparation.

(8) *The Regents should require that, as part of the 1974 statewide master plan progress report, all the doctoral-granting institutions be required to review their doctoral programs from the point of view of determining anew their purpose, place, and need in overall institutional plans.*

This recommendation is made to emphasize the responsibility and opportunity institutions have, particu-

larly at this time and in conjunction with this specific study, to review their plans with respect to doctoral programs. The review should include consideration of the many factors that have been discussed in this report, such as the quality of and need for doctoral programs, but should also consider the relative importance of these doctoral offerings to the institutions' overall programs. The commission is particularly sensitive to the need for institutions to reconsider the benefits of allocation of resources to doctoral programs as compared with other needs on the campus.

It may be said that such reviews are part of the regular ongoing business of an institution and indeed it is expected that this is so. The reason for emphasizing it at this juncture is that within the context of the recommendations proposed in this report, a significant atmosphere for change is generated. The opportunity for effecting such change, where warranted, should not be lost.

(9) *The Commissioner of Education should end the moratorium on new doctoral programs when ready to implement criteria and procedures that will insure that any new programs fully meet rigorous standards of potential quality and need.*

The commission recommends an end to the moratorium under the condition stated. It recommends that appropriate procedures be established to apply criteria for new programs: (1) the program must have a definite, strong commitment for support from its institution; (2) the proposed program should give definite promise of as high or higher quality than existing programs in the same field; (3) the need for the program must be clearly demonstrated; and (4) the impact of the new program on existing programs in the same field should be analyzed so that overall statewide strengths are preserved.

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Appendixes

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MEETING THE NEEDS OF DOCTORAL EDUCATION IN NEW YORK

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APPENDIX A

INSTITUTIONS AND TRENDS

1. *Doctoral-Degree-Granting Institutions in New York State*

Twenty-eight private institutions in New York award the doctorate. In the public sector, both The City University (through its Graduate Center) and the State University of New York (through 13 units) award the doctorate. Five of the State University units are contract colleges at private institutions.

2. *Doctoral Degrees Awarded in New York State by Institution, 1960, 1965, 1970*

Institutions in New York State awarded 1,597 doctorates in 1960 and 3,309 doctorates in 1970, a 107 percent increase in annual output. The private sector accounted for two-thirds of the increase, but the public sector grew at the more rapid rate, accounting for 7.5 percent of the State's doctorates in 1960 and 20.9 percent in 1970.

3. *Number of New York State Institutions Reporting Doctoral Enrollment, Fall 1971, by Major Fields and Selected Subfields*

New York has a large number of doctoral programs in most fields, judging from doctoral enrollments. For example, 25 institutions had doctoral programs in the biological sciences; 21 in the physical sciences; 20 in psychology; and 16 in the social sciences. There are also a substantial number of programs in many subfields. The public institutions as well as those in the private sector offer a comprehensive array of doctoral programs.

4. *Distribution of Doctoral Enrollments (by Percent), by Field and Institutional Control, 1971-72*

New York's public institutions accounted for 33 percent of the State's total doctoral enrollment in 1971-72. The State University accounted for 25 percent of the State's enrollment and The City University, for 8 percent. Among fields, the public sector had a relatively large share of the doctoral enrollments in the biological sciences (50 percent), foreign languages (42 percent), and letters (45 percent). The public sector had a relatively low percent of statewide enrollment in education (17 percent) and engineering (27 percent).

5. *Doctoral Degrees in New York State, 1970-71, and Projected for 1975 and 1980 by Type of Institution*

According to recent enrollment and 1972 institutional master plan data, statewide doctoral degree output will be about 4,950 in 1980 (a 50 percent increase over 1970). The private sector will increase by 9 percent and the public sector by 178 percent between 1970 and 1980 under these institutional estimates. By 1980, the public sector will account for 39 percent of the State's doctoral output under these plans. This estimate should be regarded as in the "high" range in view of recent trends.

6. *Full-Time Equivalent Doctoral Enrollments in New York State, Fall 1970, and Projected for 1975 and 1980 by Type of Institution*

Institutional estimates of enrollment increases between 1970 and 1980 are moderately lower than for degrees, reflecting the recent slowdown in enrollment growth. For the State as a whole, doctoral enrollments will increase by 40 percent between 1970 and 1980 in this estimate. The public sector would account for almost 45 percent of the State's doctoral enrollment in 1980 under the 1972 projections. The estimate in this table should be regarded as in the "high" range in view of recent trends.

7. *New Ph.D.'s and New College Teachers With Doctorates Required To Maintain Quality of Faculty, 1960-89 (United States)*

Allan Cartter has estimated that by 1985 there will be zero need for new college teachers with a doctorate in order to maintain quality. In contrast, over 40,000 new Ph.D.'s were required to maintain quality in colleges and universities in the period 1965-69.

8. *Supply and Utilization of Science and Engineering Doctorates by Broad Area of Science, 1969 and 1980 (United States)*

The National Science Foundation estimates that there will be a significant oversupply of Ph.D.'s in engineering and the social sciences in 1980 and a probable moderate oversupply in the life sciences and mathematics. Only the physical sciences are expected to be in approximate supply/utilization equilibrium in 1980.

DOCTORAL DEGREE GRANTING INSTITUTIONS IN NEW YORK STATE[1] 1972

SUNY
- University Center at Albany
- University Center at Binghamton
- University Center at Buffalo
- University Center at Stony Brook
- Health Science Center at Buffalo
- Downstate Medical Center
- Upstate Medical Center
- College of Forestry
- College of Ceramics at Alfred (Contract)
- College of Agriculture and Life Sciences at Cornell (Contract)
- College of Human Ecology at Cornell (Contract)
- School of Industrial and Labor Relations at Cornell (Contract)
- Veterinary College at Cornell (Contract)

CUNY
- University Graduate Center

MULTIVERSITIES
- Columbia University
- Cornell University
- New York University
- Syracuse University
- University of Rochester

UNIVERSITIES
- Adelphi University
- Fordham University
- Hofstra University
- Long Island University (Brooklyn Center)
- St. John's University
- Yeshiva University

COLLEGES
- New School for Social Research
- St. Bonaventure University
- Union College

ENGINEERING AND TECHNICAL SCHOOLS
- Clarkson College of Technology
- Cooper Union
- Polytechnic Institute of Brooklyn
- Rensselaer Polytechnic Institute

SPECIALIZED COLLEGES
- Juilliard School of Music
- Columbia Teachers College
- Albany Medical College
- College of Pharmaceutical Sciences, Columbia University
- New York Medical College
- Rockefeller University

SEMINARIES AND RELIGIOUS TRAINING CENTERS
- General Theological Seminary
- Hebrew Union College
- Jewish Theological Seminary of America
- Union Theological Seminary

[1] Institutions cited according to New York State Education Department Taxonomy.

Doctoral Degrees Awarded in New York State, by Institution
1960, 1965, 1970

Institution	*Doctoral Degrees Awarded* 1960-61	1965-66	1970-71	*Percent of NYS Output* 1960	1970	*Percent of Change* 1960-70	1965-70
PUBLIC, Total	120	257	691	7.51	20.88	475.83	168.87
SUNY, Total	120	252	597	7.51	18.03	397.50	136.90
Albany		10	47		1.42		370.00
Binghamton			17		0.51		
Buffalo [1]		97	210		6.34		116.49
Stony Brook		1	56		1.69		5500.00
Buffalo Health Sciences Ctr.		3	39		1.18		1200.00
Downstate Medical Center	5	6	11	0.31	0.33	120.00	83.33
Upstate Medical Center		3	7		0.21		133.33
College of Forestry	10	20	30	0.62	0.91	200.00	50.00
College of Ceramics	1	2	4	0.01	0.12	300.00	100.00
College of Agriculture and Life Sciences	85	88	147	5.32	4.44	72.94	67.05
College of Human Ecology	10	11	12	0.62	0.36	20.00	9.09
School of Industrial and Labor Relations	4	5	8	0.25	0.24	100.00	60.00
College of Veterinary Sciences	5	6	9	0.31	0.27	80.00	50.00
CUNY		5	94		2.84		1780.00
Graduate Center		5	94		2.84		1780.00
PRIVATE, Total	1477	1858	2618	92.48	79.12	77.25	40.90
PRIVATE MULTIVERSITIES, Total	908	1291	1882	56.85	56.91	107.59	46.01
Columbia	317	427	506	19.84	15.28	59.62	18.50
Cornell (excluding statutory colleges)	136	209	345	8.52	10.42	153.68	65.07
New York University	313	385	571	19.60	17.24	82.43	48.31
Syracuse	82	151	257	5.13	7.76	213.41	70.20
Rochester	60	119	203	3.76	6.22	243.33	73.11
PRIVATE UNIVERSITIES, Total	183	148	243	11.46	7.34	−19.13 [2]	64.19
Adelphi	14	14	28	0.88	0.85	100.00	100.00
Fordham	77	65	79	4.82	2.39	2.60	21.54
Hofstra			16		0.48		
St. John's	20	30	47	1.25	1.42	135.00	56.67
Yeshiva	23	39	73	1.44	2.20	217.39	87.18
University of Buffalo [1]	49			3.07			
PRIVATE COLLEGES, Total	6	21	23	0.38	0.69	283.33	9.52
New School for Social Research	5	20	23	0.31	0.69	360.00	15.00
St. Bonaventure	1	1		0.01			
PRIVATE ENGINEERING and TECHNICAL SCHOOLS, Total	87	153	217	5.45	6.55	149.43	41.83
Clarkson		5	17		0.51		2.40
Cooper Union			2		0.01		
Polytechnic Institute of Brooklyn	48	72	106	3.01	3.20	120.83	47.22
Rensselaer Polytechnic Inst.	39	76	92	2.44	2.78	135.90	21.05
PRIVATE SPECIALIZED INST.	277	225	233	17.34	7.04	−15.88	3.56
Albany Medical College	1	3	2	0.06	0.06	100.00	−33.33
College of Pharmaceutical Sciences, Columbia University		1	6				
New York Medical College					0.18		
Rockefeller University	10	18	23	0.63	0.69	130.00	27.78
Juilliard School of Music			7		0.21		
Columbia Teachers College	266	203	195	16.65	5.89	−26.69	−3.94

[1] University of Buffalo was a private institution until 1962 and the SUNY University Center at Buffalo thereafter.

[2] Attributable to University of Buffalo merger with SUNY.

Sources: New York State Education Department, "College and University Degrees," 1960-61, 1965-66; Higher Education General Information Survey, Degrees Awarded, 1970-71; State University of New York, Office of Institutional Research, "Trends in Enrollment and Degrees Granted, 1948-1970" (Report No. 11); Columbia University Teachers College, "Dean's Report," 1962.

Doctoral Degrees Awarded in New York State, by Institution
1960, 1965, 1970—(Continued)

Institution	*Doctoral Degrees Awarded* 1960-61	1965-66	1970-71	*Percent of NYS Output* 1960	1970	*Percent of Change* 1960-70	1965-70
PRIVATE THEOLOGICAL SCHOOLS	16	20	20	1.00	0.60	25.00	0.00
General Theological Seminary	1		1	0.06	0.03	0.00	
Hebrew Union College	1	1	2	0.06	0.06	100.00	100.00
Jewish Theological Seminary	4	3	4	0.25	0.12	0.00	33.33
Union Theological Seminary	10	16	13	0.63	0.39	30.00	−19.75
NEW YORK STATE, Total	1597	2115	3309	100.00	100.00	107.39	56.60

Number of New York State Institutions Reporting Doctoral Enrollment, Fall 1971,
by Major Field and Selected Subfield

Fields	Total	*Public* SUNY	CUNY	Total	*Private* Multiversities [1]	All Other	N.Y.S.
Agriculture, Total	2	2					2
Architecture and Environmental Design, Total				2	2		2
Area Studies, Total	1	1		3	2	1	4
Biological Sciences, Total	11	10	1	14	5	9	25
Botany	2	2		2	2		4
Bacteriology, Microbiology	5	5		6	3	3	11
Zoology	2	2		2	2		4
Pharmacology	4	4		6	3	3	10
Physiology	4	4		8	4	4	12
Biochemistry	6	5	1	9	5	4	15
Entomology	2	2					2
Genetics	1	1		4	2	2	5
Business and Management, Total	3	2	1	6	5	1	9
Communications, Total	1	1		2	2		3
Computer Sciences, Total	2	2		5	3	2	7
Education, Total	4	3	1	9	4	5	13
Ed. of Mentally Retarded				3	1	2	3
Ed. of Emotionally Disturbed				2		2	2
Social Foundations of Education	2	2		3	2	1	5
Educational Psychology	3	2	1	8	3	5	11
Student Personnel	1	1		6	3	3	7
Ed. Admin. & Supervision	2	2		7	3	4	9
Admin. of Special Education				3	2	1	3
Curriculum and Instruction	2	2		5	2	3	7
Higher Education, general	1	1		3	2	1	4
Engineering, Total	6	5	1	10	5	5	16
Chemical Engineering	2	1	1	9	5	4	11
Civil Engineering	2	1	1	8	5	3	10
Electrical Engineering	3	2	1	8	5	3	11
Mechanical Engineering	2	1	1	6	5	1	8
Fine and Applied Arts, Total	3	2	1	5	4	1	8
Music	2	1	1	5	4	1	7
Foreign Languages, Total	5	4	1	6	4	2	11
French	4	3	1	5	4	1	9
German	5	4	1	4	4		9
Spanish	4	3	1	4	4		8
Russian and Other Slavic Lang.							

[1] Columbia (excluding Teachers College and College of Pharmaceutical Sciences), Cornell (excluding four contract colleges), New York University, Syracuse, Rochester.

Source: Higher Education General Information Survey, "Advanced Degree Enrollments, Fall 1971."

Number of New York State Institutions Reporting Doctoral Enrollment, Fall 1971, by Major Field and Selected Subfield—(continued)

Fields	*Public*			*Private*			
	Total	SUNY	CUNY	Total	Multiversities [1]	All Other	N.Y.S
Health Professions, Total	4	4		4	3	1	8
Home Economics, Total	1	1		2	2		3
Law, Total				3	3		3
Letters, Total	5	4	1	11	5	6	16
English and English Literature	5	4	1	8	5	3	13
Linguistics	2	1	1	4	4		6
Philosophy	4	4		10	5	5	14
Classics	2	2		4	3	1	6
Comparative Literature	2	1	1	3	3		5
Library Science, Total				2	2		2
Mathematics, Total	6	5	1	11	5	6	17
Physical Sciences, Total	6	5	1	15	5	10	21
Physics	5	4	1	14	5	9	19
Chemistry	6	5	1	14	5	9	20
Geology	2	2		5	4	1	7
Astronomy	1	1		2	2		3
Psychology, Total	6	5	1	14	5	9	20
Public Affairs and Services, Total	2	2		4	3	1	6
Social Work				2	1	1	2
Social Sciences, Total	7	6	1	9	5	4	16
Anthropology	5	4	1	6	5	1	11
Economics	6	5	1	8	5	3	14
History	5	4	1	7	5	2	12
Geography	1	1		2	2		3
Political Science and International Relations	5	4	1	7	5	2	12
Sociology	6	5	1	7	4	3	13
Theology, Total				3		3	3
Interdisciplinary Studies, Total	2	2		3	3		5
Number of Institutions Reporting Doctoral Enrollment	14	13	1	27	5	22	41

Distribution of Doctoral Enrollments (by Percent), by Field and Institutional Control, 1971-72

Field	Total	*Public* SUNY	CUNY	Total	*Private* Multiversities [1]	All Other	*N.Y.S. Total* No.	Percent
Agriculture, Total	100.00	100.00					209	100
Architecture and Environmental Des.				100.00	100.00		58	100
Area Studies, Total	17.14	17.14		82.86	77.14	5.72	70	100
Biological Sciences, Total	49.89	39.68	10.21	50.11	34.39	15.72	2175	100
Botany, General	95.74	95.74		4.26	4.26		47	100
Bacteriology, Microbiology	46.85	46.85		53.15	42.34	10.81	111	100
Zoology, General	27.91	27.91		72.09	72.09		43	100
Pharmacology	59.35	59.35		40.65	22.76	17.89	123	100
Physiology	41.18	41.18		58.82	36.27	22.55	102	100
Biochemistry	52.28	33.68	18.60	47.72	30.18	17.54	285	100
Entomology	100.00	100.00					59	100
Genetics	51.28	51.28		48.72	7.69	41.03	39	100
Business and Management, Total	42.68	12.58	30.10	57.32	51.75	5.57	485	100
Communications, Total	2.08	2.08		97.92	97.92		48	100
Computer Sciences, Total	34.29	34.29		65.71	37.42	28.29	350	100
Education, Total	16.68	16.13	0.55	83.32	25.57	57.75	5120	100
Ed. of Mentally Retarded				100.00	4.35	95.65	46	100
Ed. of Emotionally Disturbed				100.00		100.00	27	100
Social Foundations of Education	29.21	29.21		70.79	15.17	55.62	178	100
Educational Psychology	20.53	16.18	4.35	79.47	6.38	73.09	643	100
Student Personnel	13.48	13.48		86.52			267	100
Ed. Administration and Supervision	24.09	24.09		75.91	21.69	54.22	1042	100
Admin. of Special Education				100.00	64.10	35.90	39	100
Curriculum and Instruction	28.51	28.51		71.49	15.33	56.16	463	100
Higher Education, General	25.44	25.44		74.56	26.75	47.81	228	100
Engineering, Total	27.43	23.32	4.11	72.57	48.92	23.65	2118	100
Chemical Engineering	23.74	13.70	10.05	76.26	50.69	25.57	219	100
Civil Engineering	20.73	14.51	6.22	79.27	52.85	26.42	193	100
Electrical Engineering	24.61	18.20	6.41	75.39	51.65	23.74	577	100
Mechanical Engineering	22.39	14.43	7.96	77.61	52.74	24.87	201	100
Fine and Applied Arts, Total	23.18	8.73	14.45	76.82	73.96	2.86	699	100
Music	20.56	5.93	14.63	79.44	72.47	6.97	287	100
Foreign Languages, Total	42.31	21.67	20.64	57.69	51.12	6.57	1066	100
French	44.02	20.38	23.64	55.98	49.19	6.79	368	100
German	58.28	44.78	13.50	41.72	41.72		163	100
Spanish	62.32	21.26	41.06	37.68	37.68		207	100
Russian and Other Slavic Languages				100.00	100.00		49	100
Health Professions, Total	56.99	56.99		43.01	43.01		286	100
Home Economics, Total	69.00	69.00		31.00	31.00		100	100
Law, Total				100.00	100.00		14	100
Letters, Total	44.56	33.13	11.43	55.44	41.05	14.39	2765	100
English and English Literature	52.80	42.51	10.29	47.20	38.45	8.75	1623	100
Linguistics	32.95	19.66	13.29	67.05	67.05		173	100
Philosophy	27.19	27.19		72.81	40.90	31.91	423	100
Classics	35.00	35.00		65.00	46.25	18.75	80	100
Comparative Literature	38.46	6.99	31.47	61.54	61.54		143	100
Library Sciences, Total				100.00	100.00		35	100
Mathematics, Total	34.91	28.49	6.42	65.09	52.03	13.06	888	100

[1] Columbia (excluding Teachers College and College of Pharmaceutical Sciences), Cornell (excluding four contract colleges), New York University, Syracuse, and Rochester.

Source: Higher Education General Information Survey, "Advanced Degree Enrollment, Fall 1971."

Distribution of Doctoral Enrollments (by Percent), by Field and Institutional Control, 1971-72—(continued)

Field	*Public* Total	SUNY	CUNY	*Private* Total	Multiversities [1]	All Other	*N.Y.S. Total* No.	Percent
Physical Sciences, Total	32.90	25.64	7.26	67.10	50.23	16.86	2562	100
Physics	30.65	23.17	7.48	69.35	55.43	13.92	1243	100
Chemistry	34.59	25.63	8.96	65.41	41.33	24.08	1038	100
Geology	23.70	23.70		76.30	71.10	5.20	173	100
Astronomy	5.26	5.26		94.74	94.74		38	100
Psychology, Total	34.50	16.77	17.73	65.50	22.33	43.17	2087	100
Public Affairs and Services, Total	21.85	21.85		78.15	73.62	4.53	508	100
Social Work				100.00	72.94	27.06	85	100
Social Sciences, Total	34.08	21.48	12.61	65.92	54.24	11.67	4172	100
Anthropology	47.62	28.14	19.48	52.38	49.35	3.03	462	100
Economics	33.47	23.11	10.36	66.53	48.61	17.93	753	100
History	38.09	23.83	14.26	61.91	53.71	8.20	1171	100
Geography	4.26	4.26		95.74	95.74		47	100
Political Science & International Relations	31.23	15.15	16.09	68.77	57.37	11.39	746	100
Sociology	32.08	19.13	12.95	67.92	48.91	19.01	826	100
Theology, Total				100.00		100.00	66	100
Interdisciplinary Studies, Total	39.32	39.32		60.68	60.68		969	100
ALL FIELDS, TOTAL	33.48	24.76	8.73	66.52	42.56	23.95	26,959	100

Doctoral Degrees in New York State, 1970-71 and Projected for 1975 and 1980 by Type of Institution

Type of Institutions	Degrees 1970	1975 (proj.)	1980 (proj.)	Projected Percent of Change 1970-75	1975-80	1970-80	Percent of N.Y.S. Doctoral Degrees 1970	1975 (proj.)	1980 (proj.)
Public, Total [1]	691	1,269	1,920	+83.65	+51.30	+177.86	20.88	30.68	38.73
SUNY, Total	597	909	1,384	+52.26	+52.26	+131.83	18.04	21.98	27.92
University Centers	330	666	1,066	+101.82	+60.06	+223.03	9.97	16.10	21.50
Medical & Health Science	57	68	114	+19.30	+67.68	+100.00	1.72	1.64	2.30
Contract & Special Colleges	210	175 [3]	204 [3]	−16.67	+16.57	−2.86	6.35	4.23	4.12
CUNY									
Graduate Center	94	360	536	+282.98	+48.89	+470.21	2.84	8.70	10.81
Private, Total [2]	2,618	2,867	3,037	+9.51	+5.93	+16.00	79.12	69.32	61.27
Multiversities	1,882	1,951	2,047	+3.66	+4.92	+8.77	56.87	47.17	41.30
Universities	243	337	367	+38.68	+8.90	+51.03	7.34	8.15	7.40
Colleges	23	50	69	+117.39	+38.00	+200.00	0.69	1.21	1.39
Technical & Engineering Schools	217	198	217	−8.76	+9.60	0.00	6.56	4.79	4.38
Specialized Schools and Theological Schools	253	331	337	+30.83	+1.81	+33.20	7.65	8.00	6.79
NEW YORK STATE, Total	3,309	4,136	4,957	+24.99	+19.85	+49.80	100	100	100

[1] 1975 and 1980 degrees estimated on basis of .22 × FTE doctoral enrollment 5 years earlier.

[2] 1975 and 1980 degrees derived from 1972 institutional master plans.

[3] This estimate is probably too low. See 1 for method.

Source: 1972 institutional master plans; Higher Education General Information Survey, Degrees Awarded 1970-71.

Full-Time Equivalent Doctoral Enrollments in New York State, Fall 1970 and Projected for 1975 and 1980 by Type of Institution

Type of Institution	Full-Time Equivalent Enrollment			Projected Percent of Change			Percent of N.Y.S. FTE Doctoral Enrollment		
	1970	1975 (proj.)	1980 (proj.)	1970-75	1975-80	1970-80	1970	1975 (proj.)	1980 (proj.)
Public, Total	5,754	8,707	11,846	+51.32	+36.05	+105.87	30.67	39.47	45.19
SUNY, Total	4,130	6,290	8,800	+52.32	+39.90	+113.08	22.01	28.51	33.57
University Centers	3,028	4,845	6,960	+60.01	+43.65	+129.85	16.14	21.96	26.55
Medical & Health Sciences	307	515	765	+67.75	+48.54	+149.19	1.64	2.33	2.92
Contract & Specialized Colleges	795	930	1,075	+16.98	+15.59	+35.22	4.23	4.22	4.10
CUNY Graduate Center	1,624	2,417	3,046 [1]	+48.83	+26.02	+87.56 [1]	8.66	10.96	11.62 [1]
Private, Total	13,008	13,352	14,370	+2.64	+7.62	+10.47	69.33	60.53	54.81
Multiversities	9,186	9,097	9,808	+0.07	+7.82	+6.77	48.96	41.24	37.41
Universities	1,278	1,407	1,500	+10.09	+6.61	+17.37	6.81	6.38	5.72
Colleges	214	194	281	−9.35	+44.85	+31.31	1.14	0.88	1.07
Technical & Engineering Schools	602	622	735	+3.32	+18.17	+22.09	3.21	2.82	2.80
Specialized Schools and Theological Schools	1,728	2,032	2,046	+17.59	+0.69	+18.40	9.21	9.21	7.81
NEW YORK STATE, Total	18,762	22,059	26,216	+17.57	+18.84	+39.73	100%	100%	100%

[1] CUNY 1980 FTE enrollment is based on an extension of the projected growth, 1971-75 (26 percent). CUNY did not project to 1980 in 1972 master plan.

Source: Institutional Master Plans, 1972; "State University of New York 1970-71 Headcount Enrollment and Full-Time Equivalent Workload Statistics of Credit Course Students."

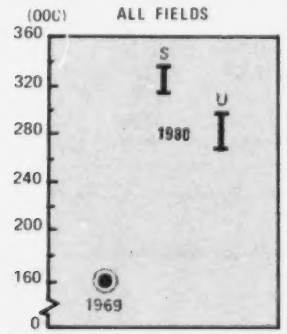
New Ph.D.'s and New College Teachers With Doctorates Required To Maintain Quality of Faculty, 1960-89 (United States)

Period	1 Ph.D.'s *Awarded*	2 New Teachers (With Ph.D.) *Required*	3 Ratio *1:2*
		Actual	
1960-64	59.3	33.9	1.8
1965-69	103.6	41.5	2.5
		Projected	
1970-74	157.6	47.7	3.3
1975-79	204.1	44.2	4.6
1980-84	258.0	27.1	9.5
1985-89	?	−0.4	∞

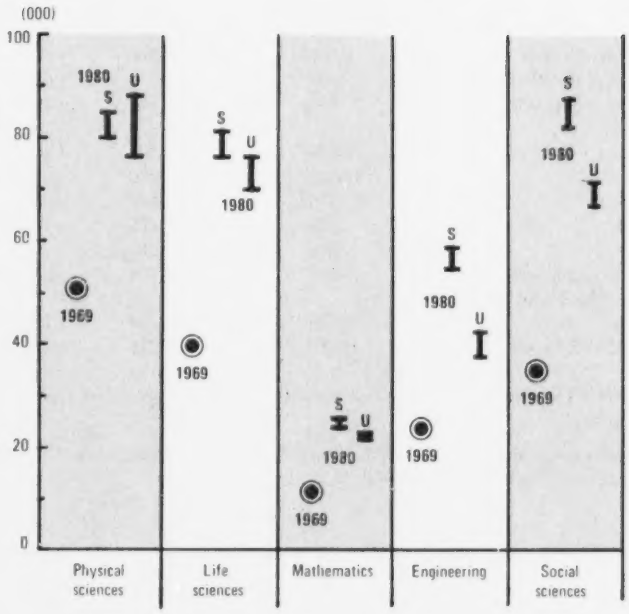
Source: Allan M. Cartter, "Scientific Manpower for 1970-85," Science, vol. 172, p. 135.

Chart 1

Supply and utilization of science and engineering doctorates, by broad area of science, 1969 and 1980.



Note: Vertical bars indicate range between high and low projected values of supply and utilization.



Source: National Science Foundation, "1969 & 1980 Science and Engineering Doctorate Supply and Utilization" (NSF 71-20), May 1971.

APPENDIX B

RESIDENCE AND MIGRATION

1. *Intrastate Migration of Full- and Part-Time Graduate Students, Fall 1968*

Among all full-time graduate students who were New York State residents attending institutions in New York State in the fall of 1968, there was a large net migration into New York City and the Central region of the State, and a large net migration out of the Long Island and Mid-Hudson regions. These latter two regions are substantially within commuting distance of New York City. Other regions were in approximate balance.

2. *Home Residence of Graduate Students and Doctoral Students in New York State Doctoral-Granting Institutions (by Percent), Fall 1968 (Full- and Part-Time Combined)*

In the fall 1968, 70 percent of doctoral students in New York State institutions were also New York residents, 21 percent were from other states, and 9 percent were not United States citizens. In the public sector, 77 percent of the doctoral students were State residents; and in the private sector, 68 percent were State residents. The degree of cosmopolitanism in doctoral student origins varies greatly. For example, among the five private multiversities the percent of State residents ranged from 39 percent to 89 percent.

3. *Migration of 1958-66 Doctorate Recipients for First Post-Doctoral Job, by Employer and Field*

In the period 1958-66, New York was a net exporter of new doctorates. About 2,500 more new New York State doctorates left the State than new doctorates from other states entered the State. Almost half of those who left the State found employment in an educational institution. There was a slight net inmigration in the industrial sector of employment. Among major fields of study, education accounted for over one-third of the total net outmigration of 2,500. Foreign emigration comprises most of the "other" employment sector, which accounted for almost 45 percent of the total net outmigration of 2,500.

Intrastate Migration of Full- and Part-Time Graduate Students
(New York State Residents Who Attend Graduate School in New York State), Fall 1968

New York State Higher Education Planning Region	*Full-Time* Out (−)	*Full-Time* In (+)	*Full-Time* Net (− or +)	*Part-Time* (Out) (−)	*Part-Time* In (+)	*Part-Time* Net (− or +)
Western	−384	+555	+171	−210	+341	+131
Genesee Valley	−538	+418	−120	−378	+205	−173
Central	−288	+2003	+1715	−222	+767	+545
Northern	−91	+100	+9	−125	+12	−113
Northeast	−465	+506	+41	−557	+559	+2
Mid-Hudson	−1982	+48	−1934	−4507	+274	−4233
Metropolitan	−1286	+3009	+1723	−1610	+8868	+7258
Long Island	−1880	+275	−1605	−4728	+1311	−3417

Source: New York State Education Department, Office of Planning in Higher Education.

Home Residence of Graduate Students and Doctoral Students
in New York State Doctoral-Granting Institutions (by Percent), Fall 1968
(Full- and Part-Time Combined)

Institution	Total Number		Same County as Inst.		Same Higher Ed. Planning Reg. as Inst.		N.Y.S. Residence		All Other States		Foreign	
	Grad.	Doct.	Grad.	Doct.	Grad.	Doct.	Grad.	Doct.	Grad.	Doct.	Grad.	Doct.
SUNY, Total	10018	2963	48.79	46.84	56.73	54.74	84.02	74.99	8.17	13.70	7.82	11.31
Albany	3163	496	27.06	20.77	33.23	32.06	90.58	81.25	6.39	14.11	3.04	4.64
Binghamton	1067	162	56.70	48.15	64.48	54.32	78.44	70.99	10.87	15.43	10.68	13.58
Buffalo	4995	1806	61.90	55.04	71.23	62.62	83.74	76.30	7.53	12.90	8.73	10.80
Stony Brook	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Buffalo Health Sciences Center	369	242	53.93	49.59	58.81	51.65	72.63	64.88	13.01	17.36	14.36	17.77
Downstate Medical Center	61	56	44.26	48.21	60.66	66.07	81.97	83.93	4.92	1.79	13.11	14.29
Upstate Medical Center	51	46	27.45	28.26	47.06	50.00	88.24	86.96	5.88	6.52	5.88	6.52
College of Forestry	263	136	34.98	37.50	39.16	40.44	54.37	50.74	20.53	22.06	25.10	27.21
College of Ceramics	49	19	6.12	4.08	10.20	21.05	53.06	68.42	32.65	10.53	14.29	21.05
College of Agriculture and Life Sciences	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
College of Human Ecology	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
School of Industrial and Labor Relations	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
College of Veterinary Science	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CUNY	1453	1441	24.64	24.64	70.68	70.71	81.00	81.12	11.01	11.03	7.98	7.84
PRIVATE MULTIVERSITIES												
Columbia	7918	1778	28.33	35.94	43.67	50.17	56.06	60.63	31.09	26.10	12.84	13.27
Cornell	4278	619	12.37	17.77	17.32	20.03	52.45	56.54	38.15	23.42	9.40	20.03
New York Universities	15642	4857	23.78	25.53	53.39	53.55	69.88	69.75	22.28	21.33	7.84	8.91
Syracuse	7586	2145	62.80	83.31	75.22	84.57	90.02	89.04	7.38	7.93	2.60	3.03
Rochester	3232	1332	45.64	9.61	50.31	12.99	64.94	39.49	25.40	40.47	9.65	20.05
PRIVATE UNIVERSITIES												
Adelphi	3327	153	48.21	37.91	72.32	52.29	98.74	96.08	1.23	3.92	0.03	0.00
Fordham	2566	NA	19.91	NA	54.40	NA	75.84	NA	24.16	NA	0.00	NA
Hofstra	4456	144	58.44	54.86	85.37	79.17	99.35	100%	0.54	0.00	0.11	0.00
Long Island University	1208		57.62		90.81		96.36		3.48		0.08	
St. John's	3015	464	42.16	33.62	63.85	55.39	90.35	81.47	4.74	8.41	4.91	10.13
Yeshiva	1681	NA	26.12	NA	70.85	NA	85.66	NA	12.20	NA	2.14	NA
PRIVATE COLLEGES												
New School for Social Research	2440	660	35.28	27.73	62.79	52.58	73.16	64.39	20.70	26.82	6.15	8.79
St. Bonaventure	279	5	55.56	0.00	69.53	0.00	76.70	0.00	22.94	100%	0.36	0.00
Union College	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PRIVATE TECHNICAL SCHOOLS												
Clarkson	220	86	20.00	33.72	21.36	34.88	64.09	80.23	15.45	11.63	20.45	8.14
Cooper Union	62	10	17.74	10.00	54.84	60.00	69.35	70.00	16.13	10.00	14.52	20.00
Polytechnic Institute of Brooklyn	2672	865	19.50	20.46	46.15	46.94	80.46	73.41	15.19	20.35	4.34	6.24
Rensselaer Polytechnic Institute	1415	561	39.79	48.84	65.37	72.91	77.31	82.89	19.08	13.90	3.60	3.21

Home Residence of Graduate Students and Doctoral Students
in New York State Doctoral-Granting Institutions (by Percent), Fall 1968
(Full- and Part-Time Combined)—(continued)

Institution	Total Number		Same County as Inst.		Same Higher Ed. Planning Reg. as Inst.		N.Y.S. Residence		All Other States		Foreign	
	Grad.	Doct.	Grad.	Doct.	Grad.	Doct.	Grad.	Doct.	Grad.	Doct.	Grad.	Doct.
PRIVATE SPECIALIZED INSTITUTIONS												
Albany Medical College	20	19	30.00	31.58	35.00	36.84	70.00	73.68	15.00	15.79	15.00	10.53
New York Medical College	115	45	7.83	6.67	33.91	57.78	53.91	73.33	37.39	11.11	8.70	15.56
College of Pharmaceutical Science, Columbia Univ.	65	6	7.69	0.00	24.62	0.00	33.85	0.00	6.15	16.67	60.00	83.33
Rockefeller University	141	141	10.64	10.64	19.15	19.15	27.66	27.66	60.99	60.99	11.35	11.35
Juilliard School of Music	140	35	35.71	57.14	42.86	64.71	50.71	71.43	34.29	17.14	15.00	11.43
Columbia Teachers College	5548	1782	18.78	14.93	36.64	31.48	59.88	56.62	34.57	39.56	5.55	3.82
PRIVATE THEOLOGICAL SCHOOLS												
General Theological Seminary	14	4	28.57	50.00	35.71	50.00	50.00	50.00	28.57	0.00	21.43	50.00
Hebrew Union College	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jewish Theological Seminary	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Union Theological Seminary	232	49	27.59	24.49	37.50	30.61	48.28	44.90	36.64	44.90	15.09	10.20
PUBLIC, TOTAL	11471	4404	45.73	39.58	58.50	59.97	83.64	77.00	8.53	12.83	7.84	10.17
PRIVATE, TOTAL	68272	15760	33.92	32.96	55.57	50.22	74.12	67.68	19.80	23.31	6.08	9.01
NEW YORK STATE, TOTAL	79743	20164	35.62	34.41	55.99	52.35	75.49	69.71	18.18	21.02	6.33	9.26

Source: New York State Education Department, Office of Planning in Higher Education.

Migration of 1958-66 Doctorate Recipients for First Post-Doctoral Job by Employer and Field

Field of Ph.D.	EDUCATION			GOVERNMENT			INDUSTRY			OTHER			TOTAL		
	Out	In	Net	Out	In	Net	Out	In	Net	Out	In	Net	Out	In	Net
Physical Science,															
Total	659	605	−54	86	50	−36	780	811	+31	363	118	−245	1888	1584	−304
Math	120	121	+1	9	1	−8	22	56	+34	35	9	−26	186	187	+1
Physics & Astronomy	184	137	−47	27	24	−3	86	103	+17	81	32	−49	378	296	−82
Elem. Part.	51	43	−8	5	8	+3	2	6	+4	16	12	−4	74	69	−5
Solid St.	43	33	−10	7	3	−4	41	57	+16	11	5	−6	102	98	−4
Chemistry	172	180	+8	16	16	—	340	343	+3	111	49	−62	639	588	−51
Organic	75	73	−2	4	4	—	188	195	+7	47	18	−29	314	290	−24
Physical	60	55	−5	10	5	−5	108	76	−32	44	16	−28	222	152	−70
Earth Science	37	51	+14	14	2	−12	18	13	−5	27	3	−24	96	69	−27
Engineering	146	116	−30	20	7	−13	314	296	−18	109	25	−84	589	444	−145
Chemical	14	12	−2	4	3	−1	88	52	−36	15	3	−12	121	70	−51
Electrical	36	29	−7	3	1	−2	53	86	+33	26	8	−18	118	124	+6
Biological Science															
Total	385	330	−55	93	69	−24	65	96	+31	346	114	−232	889	609	−280
Agriculture & Forestry	70	38	−32	29	6	−23	14	14	—	106	9	−97	219	67	−152
Health Science	23	30	+7	8	7	−1	8	45	+37	35	7	−28	74	89	+15
Biochemistry, Biophysics	127	120	−7	18	34	+16	25	16	−9	83	58	−25	253	228	−25
Anatomy, Cytol	98	78	−20	27	13	−14	13	18	+5	78	18	−60	216	127	−89
Ecol, Hydiobi	10	7	−3	3	—	−3	—	—	—	7	—	−7	20	7	−13
Botany, Zoology	57	57	0	8	9	+1	5	3	−2	37	21	−16	127	90	−37
Social Science															
Total	637	398	−239	139	43	−96	59	83	+24	362	78	−248	1197	602	−595
Psychology	205	145	−60	91	31	−60	32	36	+4	129	29	−100	457	241	−216
Anthropology, Archeology	40	25	−15	2	1	−1	—	—	—	24	4	−20	66	30	−36
Sociology	73	52	−21	3	1	−2	6	3	−3	45	11	−34	127	67	−60
Economics	127	70	−57	18	5	−13	15	39	+24	75	18	−57	235	132	−103
Political Science	139	84	−55	19	2	−17	3	4	+1	64	7	−57	225	97	−123
Arts & Humanities															
Total	810	619	−191	16	5	−11	3	17	+14	121	24	−97	950	665	−285
History	219	143	−76	11	2	−9	1	4	+3	28	7	−21	259	156	−103
English & American Language	259	197	−62	—	1	+1	2	3	+1	30	3	−27	291	204	−87
Modern Foreign Language	92	87	−5	3	—	−3	—	5	+5	26	3	−23	121	96	−26
Classic Languages	20	21	+1	—	—	—	—	—	—	7	1	−6	27	22	−5
Philosophy	73	63	−10	—	—	—	—	2	+2	13	3	−10	86	68	−18
Speech & DA	25	56	+31	2	2	—	—	—	—	2	2	—	29	60	+31
Fine Arts, Music	115	50	−65	—	—	—	—	2	+2	13	5	−8	128	57	−71
Prof. Ph. D.'s Total	161	79	−82	9	—	−9	7	16	+9	76	25	−51	253	120	−133
Bus. Adm.	58	35	−23	4	—	−4	6	14	+8	18	2	−16	86	51	−35
Rel. & Theo.	56	26	−30	1	—	−1	—	—	—	30	17	−13	87	43	−44
Education Total	950	308	−642	70	12	−58	14	11	−3	249	17	−232	1233	348	−935
All Fields Total	3602	2339	−1263	413	179	−234	928	1034	+106	1517	376	−1141	6460	3928	−2532

Source: National Research Council, Doctorate Records File.

APPENDIX C

QUALITY

1. *Distribution of Doctoral Degrees Awarded in New York, 1966-70, According to Graduate Faculty Rating (1969)*

Sixty percent of the 1966-70 doctorates awarded in 33 disciplines in the 14 New York institutions rated in the 1969 American Council on Education survey of reputational quality were from programs rated strong and above. Only 6 percent were from programs rated marginal or inadequate. The doctorates awarded in the rated programs accounted for 91 percent of all the degrees granted in those disciplines in New York between 1966 and 1970. The percent of degree output from programs rated strong and above varied considerably. New York's high quality output in English, for example, was proportionately greater than its high quality output in chemistry.

2. *Distribution of Total Doctoral Enrollment in New York, 1971-72, According to Graduate Faculty Rating (1969)*

Fifty-four percent of the 1971-72 doctoral enrollment in 33 disciplines in the 14 New York institutions rated in the American Council on Education survey of reputational quality was in programs rated strong and above. About 10 percent of the enrollment was in programs rated marginal and inadequate. The doctoral enrollment in institutions rated in 1969 represented 67 percent of the total State doctoral enrollment. Thus, there has been a dispersion of doctoral students toward unrated (essentially new) programs and toward lower rated programs. Direct comparison of the distribution of degrees and enrollments by quality rating should be made with several considerations in mind, including the lower attrition rate of higher quality institutions and the rapid improvement of some lower rated programs.

3. *Variables Relevant to Excellence in Doctoral Programs*

A large number of variables should be examined in any assessment of quality at the doctoral level, some quantifiable and some judgmental. Variables may be categorized in terms of input, process, and output.

4. *A Critique of Reputational Studies*

Although there are clear limits to reputational studies, including possible panel bias, subjectivity, lack of panel competence, and invalid criteria, these can be largely eliminated in ratings of the scholarly ability of a faculty. The American Council on Education rating of graduate faculty quality is an example of a valid reputational study.

5. *Procedures and Guidelines for Evaluations of Doctoral Programs at the University of California, Berkeley (Excerpts)*

Internal institutional evaluations of doctoral programs should be made by a review panel of peers from outside the program being examined. They should examine three groups directly through discussion and interviews: the chairman and graduate advisors, the remainder of the faculty, and the graduate students. Aspects of the doctoral programs examined should include the structure and content of the program of study, advisement, teaching effectiveness, methods of evaluating student progress, admissions, distribution of faculty by rank and turnover data, student financial support, quantitative and qualitative student productivity, and faculty and student morale.

6. *State University of New York Guidelines for Evaluations of Graduate Programs*

Evaluations of graduate programs should be made at 5-year intervals. The first phase of evaluations of both new and existing programs should be an internal review by the faculty group involved in the particular graduate program. This internal examination should include assessment of the program in terms of perceived needs to be met and intended contributions to the discipline and to society. Second, this examination should include evaluations of quality in terms of students, faculty, and program content and organization. Third, the examination should include quantitative analysis of available and probable financial support for the program and for students, library and other facility support, present and projected enrollments, attrition rates and faculty turnover. Finally, internal evaluations should include assessment of the relation of the graduate program to other

graduate programs and to undergraduate programs at the institution; the relation of the program to other programs in the region, State, and Nation; and the opportunities and plans for interinstitutional and intrainstitutional cooperation.

In the second phase of external evaluation (normally by a panel of three highly qualified individuals from outside the unit of the State University being evaluated), the following assessments should be made: validity of the general and specific goals of the program and effectiveness with which they are being met; need for the program and its graduates; appropriateness of proposed directions of growth of the program; the quality of the instructional and research offerings of the programs; compatibility of the level of scholarship (or creative work) of the faculty with the program; sufficiency of resources for future planned growth; flexibility of the program to meet the varied needs of individual students and society; and the graduate students' perception of the quality of the program.

Following the internal and external evaluations, the Central Administration of the State University may, on the basis of the composite findings and recommendations, approve a program for a period, conditionally approve a program for a limited period, or not approve a program.

Distribution of Doctoral Degrees Awarded in New York, 1966-70, According to Graduate Faculty Rating (1969)

Field [1]	Number in Quality Category				Total in Rated Program	Total N.Y.S. Degrees	Percent in Quality Rating				Total Rated Programs	Percent of N.Y.S. Degrees in Rated Programs
	3.0-5.0	2.5-2.9	2.0-2.4	< 2.0			3.0-5.0	2.5-2.9	2.0-2.4	< 2.0		
BIOLOGICAL SCIENCES [2]	354	153	12	2	521	629	67.95	29.37	2.30	0.38	100%	82.83
Botany	18		6		24	32	75.00		25.00		100%	75.00
Zoology	12	23			35	39	34.29	65.71			100%	89.74
Pharmacology	41				41	63	100.00				100%	65.08
Physiology	48	7			55	79	87.27	12.73			100%	69.62
Microbiology and Bacteriology	21	74		2	97	107	21.65	76.29		2.06	100%	90.65
Biochemistry	122	49	4		175	208	69.71	28.00	2.29		100%	84.13
Entomology	51				51	56	100.00				100%	91.07
Developmental Biology (genetics)	41		2		43	45	95.35		4.65		100%	95.56
ENGINEERING	482	330	101		913	958	52.79	36.14	11.06		100%	95.30
Chemical Engineering		140	51		191	214		73.30	26.70		100%	89.25
Civil Engineering	89	51	10		150	153	59.33	34.00	6.66		100%	98.04
Electrical Engineering	334	69	12		415	425	80.48	16.62	2.90		100%	97.65
Mechanical Engineering	59	70	28		157	166	37.58	44.59	17.83		100%	94.58
FINE AND APPLIED ARTS												
Music	116				116	128	100.00				100%	90.63
FOREIGN LANGUAGES	218	60	32	3	313	337	69.65	19.17	10.22	0.96	100%	92.88
French	126		16		142	159	88.73		11.27		100%	89.31
German	29	26		1	56	56	51.79	46.43		1.79	100%	100.00
Spanish	35	34		2	71	78	49.30	47.89		2.82	100%	91.03
Russian	28		16		44	44	63.64		36.36		100%	100.00
LETTERS	852	58	141	35	1086	1153	78.45	5.34	12.98	3.22	100%	94.19
English	653		73	8	734	784	88.96		9.95	1.10	100%	93.62
Linguistics	35		2	25	62	62	56.45		3.23	40.32	100%	100.00
Philosophy	129	54	53	2	238	253	54.20	22.69	22.27	0.84	100%	94.07
Classics	35	4	13		52	52	67.31	7.69	25.00		100%	100.00
MATHEMATICS	330	60	97	27	514	559	64.20	11.67	18.87	5.25	100%	91.95
PHYSICAL SCIENCES	832	366	381	141	1720	1942	48.37	21.28	22.15	8.20	100%	88.57
Physics	410	175	141	33	759	833	54.02	23.06	18.58	4.35	100%	91.12
Chemistry	325	188	194	108	815	954	39.88	23.07	23.80	13.25	100%	85.43
Astronomy	10	3			13	13	76.92	23.08			100%	100.00
Geology	87		46		133	142	65.41		34.59		100%	93.66
PSYCHOLOGY	477	163	102	96	838	952	56.92	19.45	12.17	11.46	100%	88.03
SOCIAL SCIENCES	1033	196	327	165	1721	1807	60.02	11.39	19.00	9.59	100%	95.24
Anthropology	106		20	10	136	140	77.94		14.71	7.35	100%	97.14
Economics	206		93	61	360	384	57.22		25.83	16.94	100%	93.75
History	321	111	30	62	524	553	61.26	21.18	5.73	11.83	100%	94.76
Geography	17		18		35	35	48.57		51.43		100%	100.00
Political Science	245	56	94	14	409	435	59.90	13.69	22.98	3.42	100%	94.02
Sociology	138	29	72	18	257	260	53.70	11.28	28.02	7.00	100%	98.85
ALL FIELDS	4694	1386	1193	469	7742	8465	60.63	17.90	15.41	6.06	100%	91.46

[1] Population biology, molecular biology, and art history omitted.

[2] Categorization of programs for quality rating and categorization of enrollments do not match well in some subfields of biology.

Source: HEGIS, "Advanced Degree Enrollment," Fall 1971.
Kenneth D. Roose and Charles J. Anderson, "A Rating of Graduate Programs" (American Council on Education, 1970).

Distribution of Total Doctoral Enrollment in New York, 1971-1972, According to Graduate Faculty Rating (1969)

Fields [1]	Number in Quality Category				Enroll. in Rated Doct. Program	Total N.Y.S. Doct. Enroll.	Percent in Quality Rating				Total Rated Programs	% N.Y.S. Enroll. in Rated Programs
	3.0-5.0	2.5-2.9	2.0-2.4	< 2.0			3.0-5.0	2.5-2.9	2.0-2.4	< 2.0		
BIOLOGICAL SCIENCES [2]	339	74	14		427	809	79.39	17.33	3.28		100%	52.78
Botany	29				29	47	100.00				100%	61.70
Zoology	8	24			32	43	25.00	75.00			100%	74.42
Pharmacology	39				39	123	100.00				100%	31.71
Physiology	41	6			47	102	87.23	12.77			100%	46.08
Microbiology and Bacteriology	29	26			55	111	52.73	47.27			100%	49.55
Biochemistry	110	16	14		140	285	78.57	11.43	10.00		100%	49.12
Entomology	46				46	59	100.00				100%	77.97
Developmental Biology (Genetics)	37	2			39	39	94.87	5.13			100%	100.00
ENGINEERING	484	303	177		964	1190	50.21	31.43	18.36		100%	81.01
Chemical Engineering		101	73		174	219		58.05	41.95		100%	79.45
Civil Engineering	51	72	36		159	193	32.08	45.28	22.64		100%	82.38
Electrical Engineering	364	66	17		447	577	81.43	14.77	3.80		100%	77.47
Mechanical Engineering	69	64	51		184	201	37.50	34.78	27.72		100%	91.54
FINE AND APPLIED ARTS												
Music	208				208	287	100.00				100%	72.47
FOREIGN LANGUAGES	287	133	35	4	459	787	62.53	28.98	7.63	0.87	100%	58.32
French	176		30		206	368	85.44		14.56		100%	55.98
German	43	48		4	95	163	45.26	50.53		4.21	100%	58.28
Spanish	30	85			115	207	26.09	73.91			100%	55.56
Russian	38		5		43	49	88.37		11.63		100%	87.56
LETTERS	943	121	399	97	1500	2299	62.87	8.07	26.60	6.47	100%	65.25
English	735		144	45	924	1623	79.55		15.58	4.87	100%	56.93
Linguistics	77		34	39	150	173	51.33		22.67	26.00	100%	86.71
Philosophy	100	105	140	13	358	423	27.93	29.33	39.11	3.63	100%	84.63
Classics	31	16	21		68	80	45.59	23.53	30.88		100%	85.00
MATHEMATICS	361	74	193	48	676	888	53.40	10.95	28.55	7.70	100%	76.12
PHYSICAL SCIENCES	1099	226	343	135	1803	2492	60.95	12.53	19.02	7.49	100%	72.35
Physics	641	66	133	51	891	1243	71.94	7.41	14.93	5.72	100%	71.68
Chemistry	321	160	169	84	734	1038	43.73	21.53	23.02	11.44	100%	70.71
Astronomy	36				36	38	100.00				100%	94.74
Geology	101		41		142	173	71.13		28.87		100%	82.08
PSYCHOLOGY	364	224	252	286	1126	2087	32.33	19.89	22.38	25.40	100%	53.95
SOCIAL SCIENCES	1305	428	615	395	2743	4005	47.58	15.60	22.42	14.40	100%	68.49
Anthropology	155		79	28	262	462	59.16		30.15	10.69	100%	56.71
Economics	230		145	167	542	753	42.44		26.75	30.81	100%	71.98
History	391	187	124	96	798	1171	49.00	23.43	15.54	12.03	100%	68.15
Geography	22		23		45	47	48.89		51.11		100%	95.74
Political Science	328	53	109	23	513	746	63.94	10.33	21.25	4.48	100%	68.77
Sociology	179	188	135	81	583	826	30.70	32.25	23.16	13.89	100%	70.58
ALL FIELDS	5390	1583	2028	965	9906	14,844	54.41	15.98	20.47	9.74	100%	66.73

[1] Population biology, molecular biology, and art history omitted.

[2] Categorization of programs for quality rating and categorization of enrollments do not match well in some subfields of biology.

Source: HEGIS, "Advanced Degree Enrollments, Fall 1971."
Kenneth D. Roose and Charles J. Anderson, "A Rating of Graduate Programs" (American Council on Education, 1970).

Variables Relevant to Excellence in Doctoral Programs

INPUT VARIABLES	PROCESS VARIABLES	OUTPUT VARIABLES
1) Student ability 2) Faculty ability 3) Financial support 4) Physical facilities 5) Supporting disciplines	1) Morale a. Faculty b. Student 2) Efficiency a. Faculty b. Student 3) Pedagogical methods a. Curriculum content b. Instructional methods 4) Research procedures	1) Faculty research 2) Student research 3) Ph.D. alumni productivity
1) Student ability (standardized tests, GPA, fellowships held) 2) Faculty ability (scholarly reputation, past productivity of research and Ph.D.'s, doctoral training) 3) Financial support (salary levels, "soft" money, etc.) 4) Physical facilities (library volumes, library budget, laboratory facilities, etc.) 5) Supporting disciplines (must exist and meet quality indicators)	1) Morale (surveys, interviews) 2) Efficiency (degrees awarded per faculty member, attrition, completion time, workload studies) 3) Pedagogical methods (internal reviews, outside visitors) 4) Research procedures (internal reviews, outside visitors)	1) Faculty research (publication count, citation indexes, reputational studies) 2) Student research (publication count, citation indexes, dissertation reviews) 3) Ph.D. alumni productivity (placement in first job, employer satisfaction, recipient opinion polls, scholarly productivity)

Source: Robert T. Blackburn and Paul E. Lingenfelter, "Assessing Quality in Doctoral Programs: Criteria and Correlates of Excellence" (1972).

A Critique of Reputational Studies

Although a systematic criticism of reputational studies has not been published, attacks on this technique generally criticize the impartiality of the evaluating panel, the subjectivity of reputation, the competence of the panel, or the validity of the criteria used in reputational studies. Although these criticisms do not apply with equal force to the most recent reputational studies, each criticism and a defense of reputational methodology will be considered below.

First, the question of panel impartiality. It is a well-known fact that a handful of doctoral programs are *alma mater* to the majority of all Ph.D.'s. Although this pattern is changing, in 1934 Hughes' top 15 institutions accounted for 59 percent of all doctorates and in 1957 Keniston's top 15 produced 43 percent.[1] At least one reviewer equates size with quality,[2] but the high correlation between size and high reputational ratings may be explained in part by rater bias.[3] It is understandable that a professor would favor the department in which he is teaching or from which he received his degree in a reputational survey. Consequently, departments with a large faculty and alumni group will receive higher ratings, so the argument goes.

Other sources of bias may come from the procedure used to select evaluators. Keniston used department chairmen and Hughes used his faculty at Miami University (1925) and the secretary of national scholarly associations (1934) to select his panel. Department chairmen may not be representative of professional opinion in a discipline, and relying upon a single expert to select a panel risks contamination from the biases of that individual.

The American Council on Education studies reduced the possibility of rater bias by systematically selecting a balanced panel of evaluators. Graduate deans at all institutions included in the evaluation were asked to select both junior and senior faculty to participate on the panel. The large number of deans participating and the

balanced distribution of rank in the panel largely eliminates the possibility of systematic bias through panel selection procedures.

The possibility of bias through current or past affiliations is less easily mitigated, but in a large study it is relatively unimportant. Cartter's careful internal analysis of his data revealed that, as expected, raters tend to be biased toward their alma mater and current employer, but such biases tend to have negligible effect. The high split half reliability of Cartter's ratings suggests that systematic bias in the evaluating panel has been prevented by careful techniques of panel selection and by utilizing a large number of respondents.

The second major argument against reputational studies is the intrinsic subjectivity of reputation. Quoting Dr. Johnson, one respondent to the Cartter survey observed that "a compendium of gossip is still gossip." [4]

In a similar vein, some argue that "subjective" reputational studies are inferior to evaluations based upon "objective" traits such as faculty publications, library facilities, etc.[5] As Cartter observed, however, "objective" criteria are based upon subjective notions of quality one step removed.[6] Any effort at evaluation requires a degree of trust in the subjective wisdom of the evaluations, whether they assess a program directly or merely establish other indicators as criteria of quality. (In defense of reputational studies, it should be noted that high ratings tend to be correlated with "objective" measures.[7]

Third, some contend that a valid assessment of a doctoral program can only be made from first hand exposure to the program.[8] Since only a fraction of a survey panel is likely to have had direct exposure to more than a small fraction of the total population of programs, their assessments, perforce, are of dubious validity. This argument holds more weight when considering ratings of all aspects of a program than when considering ratings of a single attribute such as the scholarly ability of a faculty. Particularly in this case, faculty in a discipline have firsthand exposure to the scholarly work of their peers all over the country. The competence of scholars to evaluate the scholarly work of others is almost self-evident, even though their competence to assess other aspects of doctoral programs may be questioned if they lack firsthand information.

Fourth, and finally, the criteria of quality used in reputational studies may be challenged. The ACE studies used the "*quality of the graduate faculty* (defined in terms of scholarly achievements) in your field" and the overall "effectiveness" of the doctoral program" as criteria for the ratings.[10] Since the first criterion is the most widely cited in reviews of the reputational studies, many argue that scholarly ability alone is an insufficient condition for "quality." Other factors such as teaching effectiveness and efficiency are important as well. The second criterion, as defined, encompasses all other relevant variables, but as mentioned above, the fact that most evaluators lack direct contact with most doctoral programs casts doubt upon the validity of ratings in this category.[11] Nevertheless, scholarly competence is a necessary, if not sufficient, condition of excellence and the ability of reputational surveys to measure this attribute has not been sufficiently challenged.

One other factor related to criterion validity deserves mention. In a reputational study, the criteria deemed important by the raters must be accepted implicitly. In most cases where professional consensus obtains, a nonprofessional observer is, and should be, inclined to accept the judgment of the professional panel. But, if a discipline is undergoing fundamental changes in its methodology or theoretical framework, or if a discipline on the whole has failed to adapt itself to changing environmental needs, the values of faculty raters may be unreliable or incongruent with those of a nonprofessional observer.

In political science during the late fifties, the controversy between professors interested in behavioral approaches and those concerned with normative structural analysis quite likely was reflected in the ratings. Although partisans of either perspective may have been counterbalanced by the other, interpretation of ratings in a divided discipline is risky without some direct indication of the criteria emphasized by individual raters. And, given the possibility that an entire discipline embraces dysfunctional values, a nonprofessional should have at least some knowledge of professional norms before accepting reputational ratings uncritically.

To summarize, reputational studies have been criticized on the following grounds: (1) panel bias, (2) subjectivity, (3) panel competence, and (4) criterion validity.

In defense of reputational studies, we have suggested that (1) panel bias has been largely eliminated by the careful selection procedures of the ACE studies; (2) subjectivity cannot be escaped in evaluation no matter what technique is used; (3) professional peers are competent to evaluate scholarly work, the central criterion in reputational studies; and (4) although not a sufficient condition of general excellence, scholarly ability is necessary for a good doctoral program. Reputational studies cannot provide a comprehensive assessment of overall quality, and they deserve critical examination whenever used, but for ratings of the scholarly ability of a faculty they are a valuable and valid instrument of assessment.

Footnotes for "A Critique of Reputational Studies"

1. Bernard Berelson, "Graduate Education in the United States." New York, 1960 p. 97.
2. Walter C. Eells, "Leading American Graduate Schools," Association of American Colleges Bulletin, vol. 43, December 1957, pp. 563-576.
3. Charles F. Elton and Harriett A. Rose, "What on the Ratings Rating," American Psychologist, vol. 27, March 1972, pp. 197-201. Lauren G. Wispe, "The Bigger the Better: Productivity, Size and Turnover in a sample of Psychology Departments," American Psychologist, vol. 24, pp. 662-668.
4. Allan M. Cartter, "An Assessment of Quality in Graduate Education." Washington, D.C. 1966, p. 8.
5. Lionel S. Lewis, "On Subjective and Objective Ratings of Sociology Departments," The American Sociologist, vol. 3, May 1968, pp. 129-131.
6. Cartter, op.cit., p. 4.
7. Ibid.
8. Council of Graduate Schools, "Reassessment: Proceedings of the Tenth Annual Meeting." December 1972.
9. "Effectiveness" is defined as "the accessibility of faculty and their scholarly competence, curricula, educational and research facilities, the quality of graduate students, and other (relevant) factors."
10. Cartter, op.cit., p. 127.
11. The high correlation between "scholarly achievements" and "effectiveness" ratings suggests that raters chose to emphasize the trait they knew best when evaluating "effectiveness."

Source: Robert T. Blackburn and Paul E. Lingenfelter, "Assessing Quality in Doctoral Programs: Criteria and Correlates of Excellence" (1972), pp. 23-25.

Procedures and Guidelines for Evaluations of Doctoral Programs at the University of California, Berkeley (Excerpts)

Procedures for Review of Doctoral Programs

The reviews of doctoral programs will be guided by two major commitments: that the improvement of graduate education can be fostered most effectively by collecting as much information as possible about each program under review; and that the same procedures will be applied to all programs reviewed. In accord with these principles, the following procedures will be used as a means of securing the types of information listed in the attached itemization.

In each case, a principal source of information will be the members of the department under review; other sources of information are designated in the itemization. It is anticipated that two forms of information will be solicited from department members: written and oral. Written information will include various formal departmental announcements and documents as well as less formal letters and reports. Information will be communicated orally during the course of meetings of the review panel with department members.

Within each department, three subgroups may be distinguished: the chairman and graduate advisers; the remainder of the faculty; and the graduate students. In order to promote candor in the communications from department members in these groups to the review panel, it is proposed that information be solicited separately from each group. Accordingly, in addition to whatever documents are submitted by members of the three groups, three separate meetings will be scheduled for attendance by the panel for each group. The first of these three meetings will be a dinner discussion between the panel and the department chairman along with graduate advisers. At this time, the panel will detail its procedures for the chairman who can also use the occasion to present and discuss his own views of the doctoral program in his department. Daytime meetings will involve the remaining two groups: faculty and graduate students. A final meeting will also be scheduled to which members of all three groups will be invited. This meeting will permit the panel to present its report for discussion and comment by all components of the department prior to its presentation to the Graduate Council. Prior to preparing a final version of the report, comment on a preliminary version will also be invited from appropriate officers of other relevant units (e.g. Dean of the College).

In accord with this plan, each review will be initiated by letters from the Chairman of the Graduate Council and the Dean of the Graduate Division to the members of the three departmental groups (as well as to two other pertinent groups: Teaching Assistants and other non-Senate members of the instructional staff). These letters will invite the recipients to the appropriate meetings, outline the review procedures to be followed, and describe the kinds and forms of information the panel wishes to secure from members of each group.

The membership of the review panel will vary depending on the identity of the department under review. Every panel will include the Chairman of the Graduate Council and the Dean of the Graduate Division. The Council Chairman will appoint one or two other mem-

bers of the Council to each panel, selecting persons from departments allied with that being reviewed. And Associate Dean of the Graduate Division may be appointed to the panel by the Dean in view of the relationship between the Associate Dean's discipline and that of the department to be reviewed. Finally, a graduate student may be designated to serve on the panel and to consult with graduate students in the department under review.

While the panel is securing information directly from departmental sources, the Graduate Division will take responsibility for securing and assembling all other information listed in the attached itemization. In addition, the Graduate Division will assist the panel in preparing its report to the Council.

Guidelines for Evaluating Doctoral Programs at the University of California, Berkeley

Type of Information	*Source of Information*
A. Description of present status and expected fate of disciplines in which work is offered	Chairman, advisers, faculty, students
B. Program	
1. Original description	Graduate division
2. Approved revisions	Graduate division
3. Unauthorized revisions	Chairman and advisers, students
4. Informal description	Chairman, advisers, students
5. Course offerings	
a. Content, number, variety	Catalog
b. De facto scheduling	Schedule and directory
C. Advising	
1. Availability-frequency	Chairman, advisers, other faculty present, and former students
2. Quality	Same
D. Teaching	
1. Faculty load: formal and informal	Chairman, advisers, other faculty, and schedule and directory
2. Effectiveness	Chairman, advisers, present and former students
E. Evaluation of student progress	
1. Methods of evaluating course work	Chairman, advisers, other faculty students
2. Extracourse methods of evaluation: examinations—character, objectives, frequency, sequence, failure rate, research requirements, thesis and dissertation requirements	Chairman, advisers, other faculty, students, graduate division
	Source
F. Admissions	
1. Numbers admitted annually	Graduate division
2. Procedures	Chairman, advisers
3. Criteria	Chairman, advisers
G. Resources	
1. Faculty	
a. Number filled and vacant FTE	Chancellor

b. Distribution by rank	Chancellor
c. Turnover rate	Chancellor
d. Retirement prospects	Chancellor
e. Distribution by training institution	Chancellor
2. Student financial support; TAs, RAs, fellowships, grants, etc.	Graduate division
H. Productivity	
1. Quantity	Graduate division: EDP
a. Admission rate	
b. Years to M.A.	
c. Years to doctorate	
d. Rate of granting M.A. and doctorate	
e. Aldrich-Hammel index	
2. Quality	
a. Sample of recent theses and dissertations	Library
b. Letters from former students	Graduate division
c. Occupational history of former students	Chairman, faculty, graduate division, alumni offices
I. Morale	
1. Faculty	Chairman, advisers, faculty
2. Student	
a. Degree and methods of participation in departmental decisions	Chairman, advisers, students, G.A. reps.
b. General	Students

Source: Robert T. Blackburn and Paul E. Lingenfelter," Assessing Quality in Doctoral Programs: Criteria and Correlates of Excellence" (1972), pp. 37-41.

State University of New York
Guidelines for Evaluations of Graduate Programs

I. *Policy*

It is the policy of State University of New York to offer graduate programs to serve the need of individual students and society. To foster the attainment and maintenance of high academic quality and to promote a continuing responsiveness to changing needs for and dimensions of such programs, it is necessary to establish detailed procedures for evaluation and approval of all new graduate programs, and, thereafter, to make a careful review of all approved and active programs at regular intervals.

II. *Responsibility*

Responsibility for the conduct of each graduate degree program resides with the faculty of that program. It is also the responsibility of the faculty and administration of each unit of the university to conduct periodic reviews of all graduate programs, evaluate the findings of these reviews, report the results to the office of the provost for graduate education and research, and take actions which are intended to increase the value of the program to graduate students, the university, and society.

III. *Initiation of the Evaluation of a New P ogram*

Any interested faculty group may propose a new graduate program via the procedures set forth in the follow-

ing sections. The filing of an internal evaluation report (see section V., A.) with the dean of graduate studies (or corresponding academic officer) of a unit of State University shall constitue a request for initiation, by the dean, of the further steps in the evaluative process.

IV. *Evaluation of Existing Graduate Programs*

Periodic evaluations of existing graduate programs should be made at 5-year intervals. The dean of graduate studies (or corresponding officer) of a unit shall be responsible for initiating such reviews. Under certain circumstances evaluations at more frequent intervals may be desirable, and in special instances the interval may be somewhat longer. Subject to university policy, the president of each State University campus may approve, in consultation with the faculty of a program and the unit's graduate council or other comparable body, the delay or acceleration of the 5-year cycle.

V. *Procedure*

Each campus is responsible for establishing detailed procedures for initiating, conducting, and reporting the results of program evaluations. These procedures should be reviewed and approved by the graduate council (or other comparable body) on each campus. The following general procedures indicate the minimal requirements for an adequate evaluation of a graduate program.

A. *Internal Evaluation Report*

The first step is preparation of an internal evaluation report by the faculty group involved in the particular graduate program. This report serves the dual purpose of (1) involving responsible faculty in a critical self-study of the elements of the program and (2) informing external evaluators (see B below) of the objectives and status of the program. A similar format should be followed in the internal evaluation reports on both new programs and existing programs. Appropriate inclusions are the following:

1. *Qualitative Indexes*
   a. General rationale for the program, including perceived needs to be met, and intended contributions to the discipline and to society. Numerical data on the need for the program should be provided where available.
   b. Structure of the program
      i. Admission requirements and student selection procedures
      ii. General requirements for the degree
      iii. Specific requirements for the degree, including course descriptions, qualifying examinations, language proficiency, minors, thesis, or other terminal requirements and academic standards.
   c. Quality of students (For new programs, provide information on projected sources and caliber of students. For existing programs, outline the previous 5-year experience with respect to
      i. Sources of previous undergraduate and graduate degrees
      ii. Performance on standardized tests
      iii. Professional and scientific contributions
      iv. Placement of students on completion of degree)
   d. Quality of faculty
      i. Curriculum vitae
      ii. Participation in national and international societies and meetings
      iii. Interdisciplinary associations
      iv. Editorial, review, and committee activities
      v. Honors and awards
      vi. Publications
      vii. Instructional ability as indicated by graduate student evaluations
   e. Quality of program
      i. Foci of emphasis
      ii. Relationships to undergraduate instructional offerings
      iii. Coordination of course offerings
      iv. Advisement procedures and evaluation of student progress
      v. Innovative elements
      vi. Interdisciplinary and multidisciplinary aspects
      vii. Participation of graduate students in undergraduate instructional activity. Extent of supervision and guidance of such activity. Opportunities for graduate students to develop teaching skills.
      viii. Graduate student perceptions of quality of program
2. Quantitative Indexes
   a. (For new programs, respond to i-vi. For existing programs, outline the previous 5-year experience with respect to i-x.)
      i. Physical facilities assigned to program
      ii. Support facilities available from other sources
      iii. Library holding in this field and available from nearby libraries

iv. Staff resources—secretarial, technician, etc.
v. Financial aid for graduate students—amount and sources
vi. Financial resources for the program from the university and from other agencies
vii. Changes in faculty
viii. Trends in student enrollment—graduate and undergraduate, full-time and part-time
ix. Instructional services to other programs, including size of service load
x. Degrees completed—graduate and undergraduate

b. Next 5 years
i. Projected enrollments with rationale for these enrollment figures
ii. Resources and facilities needed to accommodate such enrollments

3. *Relation of Graduate Program to Other Programs*

a. Relation to undergraduate programs on the campus
b. Relation to other graduate programs on the campus
i. Graduate programs of other departments
ii. Interdisciplinary graduate programs
iii. Multidisciplinary programs
c. Relation to graduate programs at other State University units
i. In the region
ii. In the State
d. Relation to other graduate programs at private colleges and universities of the region and State
e. Opportunities and plans for developing cooperative relations with other graduate programs, departments, institutions, and agencies

B. *External Evaluation Report*

Following the preparation of the internal evaluation report, an evaluation panel will be selected to visit the campus and evaluate the program. This process shall include interviews with faculty, graduate students, and administrators related to the program. The evaluation panel must consist of highly qualified individuals (normally three) in the particular and/or related field who are not members of the unit of State University being evaluated. The program faculty shall provide the graduate dean with names and qualifications of individuals they believe are qualified to evaluate the program. The graduate dean and the graduate council (or other comparable body) shall be responsible for insuring that the evaluation panel is made up of individuals who are qualified to make the evaluation. Arrangements of an evaluation visit shall be made by the graduate dean.

On completion of the visit, the evaluation panel will make an oral report to the graduate dean and subsequently will provide a written report (or reports if each evaluator wishes to submit an individual statement) indicating their findings and recommendations. Particularly, in the interest of the State University as a whole, it is important that the graduate dean insure that the report include carefully considered answers to the following questions:

1. Are the general and specific goals of the program valid? How are they being met?
2. Is the need for the program and its graduates justified? Consider local, State, and national needs and the appropriateness of the program for the particular State University unit.
3. Are the proposed directions of growth of the program appropriate considering the aims of the faculty in the program, the nature of the State University, and the goals of the program?
4. What is the quality of the instructional and research (or creative) offerings of the program?
5. Is the level of scholarship (or creative work) of the faculty identified with the program suitable for this program? Does the program as operating or planned provide sufficient opportunities for continued growth in quality of scholarship and creativity?
6. Are sufficient resources available to support the program and permit the future planned growth? Consider faculty, staff support, graduate fellowship or traineeship support, space, and administrative commitment of the university unit.
7. Does the program make appropriate use of existing resources of the university and provide opportunity for innovative and flexible programs to meet the varied needs of individual students and society?
8. What is the graduate students' perception of the quality of the program?

The report of the evaluation panel shall be submitted to the graduate dean, who will then submit it to the graduate council (or other comparable body), and through the director or chairman, to the faculty members of the program. Where desirable, each of these may prepare additional written materials in response to the report of the evaluation panel.

C. *President's Review*

Copies of the internal evaluation report, the report of the evaluation panel, the faculty unit's response to the evaluation report, and the response of the graduate dean and graduate council (or other comparable body) shall be forwarded directly to the president of the institution for his review. In many cases, the president will wish to discuss aspects of these reports with interested faculty or academic officers before arriving at an institutional recommendation.

D. *Report to the Provost for Graduate Education and Research*

The president of the institution will forward copies of the internal evaluation report, the evaluation panel report, the faculty unit's response to the evaluation report, and the report of the graduate dean and graduate council (or other comparable body) to the provost for graduate education and research, for his review. In addition, the president will indicate the institutional response to the recommendations which have been made. The provost will insure that the response of Central Administration is made within 60 days. Based on the composite findings and recommendations made at the several stages of review, such response may be approval of a program for a period, conditional approval for a limited time (in some instances involving a subsequent reevaluation), or nonapproval.

APPENDIX D

COSTS AND FINANCES

1. *New York "State Purposes" Expenditures and Higher Education Support (1960-72)*

State support for higher education has increased from $90 million to $843 million between 1960 and 1972, a 740 percent increase. In 1972-73, the State University of New York received 49 percent of the State purposes funds for higher education. The City University received 11 percent; community colleges, 19 percent, students (through direct aid), 10 percent; the disadvantaged (through special programs), 5 percent; and private institutions (through direct aid), 6 percent.

2. *Projected Total Deficits in Private Doctoral-Granting Institutions 1970-71 to 1975-76, 1980-81*

In 1970-71, 22 private doctoral-granting institutions reported a combined deficit of $30.2 million. They estimate (in their 1972 master plans) that their collective deficits will be $28.9 million in 1975-76 and $31.2 million in 1980-81.

3. *Instructional Costs per Student Credit Hour on FTE Student per Year, and Cost Ratios by Level of Instruction, Public Sector, Selected States*

Analysis of direct instructional costs per credit hour by degree level in public institutions in six states shows an undergraduate to Ph.D. level cost ratio of from 1:3.01 to 1:6.79. When these relationships are averaged, the ratio of undergraduate to doctorate direct instructional cost is 1:3.99. The unit cost studies of the six states were made according to differing methods, but the resultant unit costs ratios were generally similar.

4. *Direct, Full Cost, and Weighted Full Cost Relationships by Instructional Level, Bachelor's, Master's, and Doctorate*

Using the relative cost data from six state studies (cited above), and data from the gradcost study sponsored by the Council of Graduate Schools, the full cost ratio of undergraduate to doctoral education is calculated to be 1:5.45 per FTE student. Multiplication of the credit hours required for the baccalaureate (120 credits) and the doctorate (90 credits) produces a degree cost ratio, bachelor's to doctorate, of 1:4.08. Attrition and other factors are omitted.

5. *Sample Direct Cost Instructional Cost Ranges, Medians, and Means by Discipline Group, Doctoral Level*

The gradcost study of Powel and Lamson ("Elements Related to the Costs and Benefits of Graduate Education, 1972") shows the wide range in the estimated unit direct instructional cost of doctoral education *within* each of 22 disciplines among the various institutions examined. Calculation of medians of the costs within also reveals large differences in costs between disciplines. For example, the median of direct instructional costs in English was $1,784, while for physics it was $7,322. These direct approval costs, of course, do not reflect the relative efficiency of the various disciplines. Physics, for example, generally has a lower attrition rate than English.

New York "State Purposes" Expenditures and Higher Education Support (1960-72) (Dollars in Millions)

	State Fiscal Years					Increase 1960-70	
	1972-73	1971-72	1970-71	1965-66	1960-61	Amount	Percent
State Purposes "Plus" [1]	$2,744	$2,616	$2,311	$1,068	$ 644	$1,647	250
Higher Education Support	$ 843	$ 805	$ 758	$ 266	$ 90	$ 668	740
Higher Education Share of "State Purposes"	31%	31%	33%	25%	14%	17%	121
SUNY-Regular Operations	$ 412	$ 416	$ 424	$ 141	$ 50	$ 374	750
Percent of Higher Education Funds	49	52	56	53	55	—	—
CUNY-State Aid	$ 92	$ 90	$ 86	$ 40	$ 20	$ 66	330
Percent of Higher Education Funds	11	11	11	15	22	—	—
Community College—State Aid [2]	$ 161	$ 127	$ 95	$ 22	$ 8	$ 87	1,085
Percent of Higher Education Funds	19	16	13	8	9	—	—
Aid to Students	$ 80	$ 76	$ 72	$ 61	$ 12	$ 60	500
Percent of Higher Education Funds	10	10	10	23	13	—	—
Programs for Disadvantaged Students	$ 43	$ 44	$ 32	—	—	—	—
Percent of Higher Education Funds	5	5	4	—	—	—	—
Aid to Nonpublic Institutions	$ 48	$ 47	$ 44	—	—	—	—
General Aid	$ 33	$ 33	$ 31	—	—	—	—
Health Professions Education	$ 15	$ 14	$ 13	—	—	—	—
Percent of Higher Education Funds	6	6	6	—	—	—	—
Other Support [3]	$ 6	$ 6	$ 5	$ 3	$ 1	$ 4	400
Percent of Higher Education Funds	1	1	1	1	1	—	—

[1] State purposes as defined in State budget accounts *plus* local assistance for CUNY and community colleges and capital construction for latter.

[2] Includes both operating and capital funds.

[3] "Other" includes State Education Department administrative offices for higher education, educational TV network, and SUNY and CUNY professorial chairs.

Source: New York State Education Department, Office of Higher and Professional Education, "Financing Higher Education in New York State, A Background Paper." August, 1972, pp. 4-5.

Projected Total Deficits in Private New York State Doctoral-Granting Institutions, 1970-71 to 1975-76, 1980-81 (In Thousands of Dollars)

	Total No.	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1980-81
Private Multiversities	5	$27,131(5)*	$25,771(5)	$26,546(4)	$26,567(4)	$23,876(4)	$23,672(4)	$22,577(3)
Private Universities	5	1,931(4)	1,318(3)	1,090(3)	523(2)	2,409(3)	1,573(3)	4,062(3)
Private Colleges	3	335(2)	638(2)	391(3)	411(2)	394(2)	330(2)	296(1)
Private Engineering and Technical Schools	4	163(2)	419(2)	2,538(3)	1,515(3)	1,092(3)	1,069(2)	none
Private Medical and Health Science Institutions	2	none	578(2)	709(2)	313(1)	834(1)	654(1)	180(1)
All Other Private Institutions	3	627(1)	771(2)	511(2)	1,616(2)	1,904(2)	1,586(2)	4,119(2)
New York State, TOTAL DEFICIT	22	30,187(14)	29,495(16)	31,785(17)	30,954(14)	33,509(15)	28,884(14)	31,234(10)

* Figures in parentheses ( ) are number of institutions reporting or projecting deficits in each category and year.

Source: 1972 institutional master plans.

Instructional Cost Per Student Credit Hour on FTE Student Per Year, and Cost Ratios by Level of Instruction, Public Sector, Selected States

	Colorado		South Dakota		Tennessee		Illinois		Ohio		Washington	
	Cost	Ratio	Cost	Ratio	Cost	Ratio	Cost	Ratio	Cost	Ratio	Cost	Ratio
Lower Division	9.05	1.00	16.32	1.00	12.65	1.00	36.64	1.00	755	1.00	685	1.00
Upper Division	13.58	1.50	24.36	1.49	20.30	1.60	58.47	1.60	755	1.00	1185	1.70
Undergraduate Average		1.25		1.25		1.30		1.30		1.00		1.35
M.A.	27.60	3.05	46.55	2.85	46.98	3.71	102.72	2.80	2403	3.18	2456	3.58
Ph.D.	34.11	3.77	67.01	4.11	111.68	8.83	156.48	4.27	3060	4.05	4248	4.73
Undergraduate/M.A.	1/2.44		1/1.55		1/2.85		1/2.15		1/3.18		1/2.65	
Undergraduate/Ph.D.	1/3.01		1/3.31		1/6.79		1/3.32		1/4.05		1/3.50	
Reference source	a		b		c		d		e		f	

Mean undergraduate/M.A./Ph.D. ratio = 1.00/2.24/3.99

(a) "Volume and Cost of Instructional Activity-Public Colleges and Universities in Colorado," State Education Department, Denver, March 1971, pp. 47-50.

(b) Gibb, R. D., "Graduate Programs in South Dakota State Colleges and Universities," Recommendations Submitted to South Dakota Regents of Education, Pierre, S.D., June 14, 1972.

(c) "An Instructional Analysis of Tennessee Public Higher Education," Tennessee Higher Education Commission, Nashville, Fall 1969. (Combines the costs of master's and professional education under master's costs.)

(d) "Unit Cost Study Data, 1969-70," Illinois Board of Higher Education, Springfield, August 23, 1971.

(e) "1971-72 Budgeted Expenditures per FTE Students," Ohio Board of Regents, Columbus, Ohio, 1971 (Expenditures per FTE student).

(f) "1970-71 Instructional Expenditures per Student Washington Public Institutions of Higher Education," Council on Higher Education, State of Washington, Olympia, Wash., May 1972 (Total Instructional Expenditure per student per year).

Source: David L. Dresser and David W. Chapman, "The Finance of Doctoral Education: Revenues, Expenditures, Costs and Formulas." September 1972, p. 65.

Direct, Full Cost, and Weighted Full Cost Relationships by Instructional Level, Bachelor's, Master's, and Doctor's

Level	Direct to Full Cost Factor Range	Factor Midpoint	Direct[b] Cost Relationship	Direct Cost Factor Product	Full Cost Relationship	Weighing[c] for Credit Hours Per Degree	Weighted Ratio	Weighed Full Cost Relationship BA = 1.00
Doctorate	1.3-2.6	1.95	3.99	7.80	5.45	3	16.35	4.08
Master's	1.3-1.9	1.60	2.24	3.58	2.47	1	2.47	0.62
Bachelor's	1.3-1.6[a]	1.45	1.00	1.45	1.00	4	4.00	1.00

[a] Imputed. See Joseph L. McCarthy and David R. Deener, "The Costs and Benefits of Graduate Education." Washington, D.C., 1972, p. 39 for master's and doctoral level ratios of direct costs to full costs.

[b] Computed from table.

[c] Ph.D., 90 credit hours = 3.
M.A., 30 credit hours = 1.
B.A., 120 credit hours = 4.

Source: David L. Dresser and David W. Chapman, "The Finance of Doctoral Education: Revenues, Expenditures, Costs and Formulas." September 1972, p. 68.

Sample Direct Instructional Cost Ranges, Medians and Means by Discipline Group, Doctoral Level (1970 Dollar/9-Month FTE Student Year)

Discipline (Group)	N	Range	Median	Mean
Humanities	39	$ 552-4588		$2230
Classics	4	2988-4588	$ 3686	
English	9	1120-3511	1784	
German	9	552-1970	1112	
Philosophy	8	1946-4075	2570	
Romance Languages	9	1358-3406	1998	
Social Sciences	55	532-7702		2797
Anthropology	9	1599-3427	2665	
Business Administration	7	532-7669	3529	
Economics	8	1254-3552	2693	
Geography	6	2224-7702	3067	
History	8	1233-5078	3075	
Psychology	10	1066-7596	2583	
Sociolgy	9	1599-4909	1970	
Engineering	20	1651-9083		4642
Chemical	7	2466-9083	6185	
Electrical	7	1651-5600	3707	
Mechanical	6	2508-6938	4035	
Biological Sciences	12	3198-7276		4717
Botany	6	3343-7276	5354	
Zoology	6	3198-7180	4080	
Physical Sciences	46	1129-15741		6056
Astronomy	5	3260-15741	10057	
Chemistry	13	1896-6424	3805	
Geology	8	4158-13896	6293	
Mathematics	11	1129-6186	2804	
Physics	9	1636-11075	7322	
Total 22 disciplines	172	532-15741		4088 [1]

[1]Multiplication of this average of the estimated direct costs for the 22 disciplines by the midpoint factor (1.95) for conversion to full costs (see p. 75) yields the average estimated full cost of $7,972. Sponsored research and student aid costs are excluded from these estimates.

Source: David L. Dresser and David W. Chapman, "The Finance of Doctoral Education," 1972, p. 72. Adapted from John H. Powel and Robert D. Lamson, "Elements Related to the Costs and Benefits of Graduate Education." Washington, D.C.: The Council of Graduate Schools, March 1972, pp. 245-248.

APPENDIX E

COORDINATION AND COOPERATION

1. *Strengths and Weaknesses of Cooperative Methods*

Formal cooperation and coordination among institutions may be either voluntary or statutory. Advantages of voluntary cooperation are that it provides maximal freedom of choice and the greatest likelihood of achieving consensus. Among its weaknesses are the tendency for control by the more powerful, wealthy, or prestigious members; a tendency to rest with the status quo; difficulty in identifying achievable joint goals; unpredictable financial security for the arrangements over the long run; and lack of staff resources for comprehensive long-range planning.

Among the advantages of statutory coordination are that it may lead to more rational resource allocations and effective integration of effort; it may provide a unified and effective voice for higher education in the Legislature; it insures a stable membership, thus providing for maximum program breadth. Among the weaknesses of statutory coordination are the danger of an excessive centralization of direction by the coordinating agency, leading to diminution of the distinctive character of institutional members; neglect of expertise within institutions; and possible increase of political interference in institutional affairs.

2. *Forms of Interinstitutional Cooperation (Content Categories and Their Characteristics)*

Nine possible forms of interinstitutional cooperation are joint instructional forms and techniques, joint degree programs, faculty sharing, student exchange, student research/field experience, service and applied expertise, facilities sharing, faculty development, and faculty research. These forms of cooperation require varying institutional commitment, imply differing threats to institutional autonomy, and require varying degrees of external monitoring. For example, faculty sharing generally calls for a high degree of institutional commitment, while student sharing requires only a medium degree of institutional commitment. Joint degree programs generally suggest a high threat to institutional autonomy, while student exchange and facilities sharing suggest a low threat to autonomy. Most forms of coordination can be effected through either voluntary or statutory means.

3. *Role of a State Planning Agency in Nine Forms of Interinstitutional Cooperation*

A state coordinating agency might logically actively promote each of the nine forms of cooperation cited above if it has as its primary objectives (1) either a moderate or strong coordinating stance, (2) a viable balance between the public and private sectors, (3) improvement of quality of doctoral programs while providing sufficient doctoral output. (Assumption sets A and E.)

Strengths and Weaknesses of Cooperative Methods

Strengths of Formal Voluntary Cooperation

a) Provides for maximal freedom of choice, as institutions retain the right to choose whether or not to participate in any given consortium program.
b) Provides the greatest likelihood of achieving consensus, as joint programs are generally not undertaken without at least the nominal consent of all members.
c) Can embrace a potentially wide range of institutional members, cutting across conventional boundaries to achieve great heterogeneity or homogeneity as the proclaimed objectives seem to require.
d) Provides greatest likelihood of promoting cooperation at the subinstitutional level (e.g., department heads, middle-level administrators, etc.) as a "spin-off" effect from higher levels.[1]
e) Facilitates self-generated program development at all hierarchical levels, with the consortium staff generally serving more as facilitators rather than legislators or promotors.[1]

Weaknesses of Formal Voluntary Cooperation

a) Asymmetrical arrangements are likely to be controlled by the more wealthy, powerful, or prestigious institutional members.

[1] One recent case study of a multipurpose consortium (Lancaster, 1969) has questioned the validity of these two alleged "strengths." Lancaster demonstrated that interdependencies formed *after* the establishment of the formal consortium and that the movement toward cooperation actually engendered competition and conflict among consortium members, between the members and the consortium staff, and within individual institutions. While the conflict was not generally viewed as dysfunctional, these findings do tend to cast doubt upon the above assertions.

Forms of Interinstitutional Cooperation
(Content Categories and Their Characteristics)

Content Category	Content of Exchange	Possible Advantage of Category	Possible Weaknesses of Category	Degree of Institutional Commitment Required	Perceived Threat to Institutional Autonomy	Degree of External Monitoring Required	Form of Coordination: Most Often Used	Form of Coordination: Most Likely To Guarantee Success	Feasibility for Joint-Public_Private Venture: Voluntary Means Alone	Feasibility for Joint-Public_Private Venture: w/Statutory Coordination and Consent of Privates
Instructional Forms and Techniques	information media forms techniques	innovation, sound curriculum, faculty-time savings, reduce duplication, cost savings (?)	faculty resistance, sustained commitment, top-down determination	high	high	high	voluntary	voluntary	yes	yes
Joint Degree Programs	planning faculty students responsibility	reduce duplication, sound curriculum, faculty utilization, cost savings (?)	faculty resistance, sustained commitment, required geographical proximity	high	high	medium	both	both	no	yes
Faculty Sharing	faculty compensating $ information	reduce duplication, cost savings, cross-fertilization	faculty resistance, required geographical proximity, little broad impact (?)	high	medium	medium	voluntary	voluntary	no	yes
Student Exchange	students compensating $ information	reduce duplication, student satisfaction (?), cost savings	faculty resistance, required geographical proximity, $ compensation	medium	low	high	both	both	maybe	yes
Student Research/ Field Experience	information planning students	supplemental to instruction, program quality (?), student satisfaction (?)	sustained commitment linkage available (?), little broad impact (?)	high	low	medium	voluntary	both	yes	yes
Service and Applied Expertise	information expertise	community relations problem solving faculty development, reduce duplication, cost savings	sustained commitment, community tensions (?), political interference	high	medium	medium	voluntary	both	yes	yes
Facilities Sharing	facilities compensating $	reduce duplication, cost savings	required geographical proximity, linkages available (?), $ compensation, little broad impact (?)	medium	low	medium	both	both	no	yes

Faculty Development	information faculty	faculty relevance, program quality (?)	faculty resistance, sustained commitment, meaningful objectives	high	medium	high	voluntary	voluntary	yes	yes
Faculty Research	information facilities faculty	new research, facilities utilization, faculty development, program quality (?)	linkages available (?), little broad impact (?)	medium	medium	medium	voluntary	both	yes	yes

Source: Marvin W. Peterson and John S. Waggett, "International Cooperation in Doctoral Education: A Report With Recommendations," 1972, p. 39.

b) There exists a powerful tendency to follow the status quo, since until a genuine sense of cooperative interdependence is established (and time is a major factor here, as witness the early difficulties of the Claremont federation), only peripheral programs unrelated to the central core of the institution's missions are generally attempted.

c) Consortia staff generally lack the facilities, funding, and expertise necessary to engage in comprehensive long-range planning for individual members.

d) Often institutions are not impelled to join such arrangements until the environment becomes most threatening, and at this point, their available resources to support voluntary activities may be minimal.

e) The financial security of such arrangements over the long run is unpredictable at best.

f) There is often great difficulty in identifying those joint goals which can be achieved, particularly when the concern is for some approximate equity as regards benefits received.

> Few common problems are both of central concern and easily managed, and many critical problems lack common elements (Grupe, 1971).

g) Staff personnel in formal voluntary arrangements possess only delegated powers, while the actual decision-making centers are located in each of the member institutions.

h) Such arrangements require "unusual attention to consensus-making machinery, representation, and tapping of creativity, out of all proportion to the motivation felt by the members" (Johnson, 1967).

Strengths of Statutory Coordination

a) Centralizes planning, policy making, and/or governance responsibilities for a group of institutions, which ideally should lead to more rational resource allocation and more effective integration of effort.

b) Provides a unified voice from the higher education community in the Legislature, thus ideally reducing the likelihood of legislative intrusions into the educational process, or at least channeling such interventions through an established mechanism.

c) Is inclusive of all institutions so designated by the relevant legislation, thereby "insuring" a stable membership and providing for maximum program breadth.

d) Has provided for (and recent studies indicate the trend is accelerating) a greater public role (e.g., more noninstitutional and noncentral staff) in the determination of educational policy.

e) The legislative grant of authority provides a greater assurance that individual institutions will comply with legitimate agency decisions.

f) Available evidence seems to indicate that coordinating agencies have been more successful vis-a-vis legislatures (e.g., appropriations, provisions for new construction and new programs) than individual institutions acting on their own behalf might have been.

Weaknesses of Statutory Coordination

a) The composition of the coordinating board, its conception of leadership, and its supportive staff are critical elements upon which the board's success in fulfilling a mediating role between the institutions and the Legislature will be contingent.

b) There always exists the possibility that stronger or more prestigious institutions will attempt to "end run" around the coordinating agency in order to deal directly with the Legislature.

c) Under certain conditions, this form can increase the probability of political interference in institutional affairs.

d) Excessive centralization of direction by the agency can lead to diminution of the distinctive character of institutional members.

e) Expertise within the institutions may be neglected in favor of agency staff utilization, which in turn may lead to further enlargement of agency staffs and proportionately less institutional involvement.

f) Unless so mandated, the coordinating agency may be unable to integrate private institutions into a comprehensive planning framework.

Source: Marvin W. Peterson and John S. Waggett," International Cooperation in Doctoral Education: A Report With Recommendations," 1972, pp. 7-10.

Role of a State Planning Agency in Nine Forms of Interinstitutional Cooperation

In order to demonstrate how a State agency might, under varying circumstances, respond to programs included under the nine content categories of interinstitutional cooperation, the following table has been constructed. It is intended to portray how the impact of agency role, public-private balance considerations, and qualitative emphasis might affect both the capacity and the willingness of an agency to become involved with program development in each of these categories.

These three assumptions as to the role and objectives of the agency may be further elaborated as follows:

a) *Agency Role:* agency chooses a strong, initiatory, coordinating posture over public and private institutions, or a more moderate, supportive, and less initiatory stance over all institutions.

b) *Public-Private Balance: agency* feels it is important to insure a viable balance between the public and private sectors, or deems it unimportant to exercise any special concern for such balance.

c) *Program Emphasis:* agency desires to improve the quality of doctoral programs while providing sufficient doctoral output, or feels there is no need to give undue attention to matters of quality at the expense of guaranteeing sufficient output.

For convenience, the agency role may be designated as either "strong" or "moderate"; similarly public-private balance may be stated as either "balanced" or "unbalanced," and program emphasis as either "qualitative" or "quantitative."

From these assumptions may be generated a total of eight possible "assumption sets" which represent all possible combinations of these factors. Under each of these "assumption sets," a state agency may respond in different ways to proposed cooperative programs which might be included under the nine content categories described in the text. Each of these "assumption sets" affects the State agency's willingness to consider cooperation under the various content categories, as well as its capacity to do so. For example, a strong, balanced, and qualitative State agency (Set A in following table) might well consider initiating faculty sharing programs, in contrast to a moderate, imbalanced, and quantitative agency (Set H) which, in all likelihood, would not. The latter agency's decision not to emphasize quality concerns or to provide for the welfare of private institutions would mean that, under such an agency, faculty sharing would exist only among public institutions for purposes of achieving cost savings. And, given the relatively weaker role of the agency vis-a-vis the institutions under its purview, it may possess insufficient power to initiate such programs.

The question, then, which is asked in each cell is, "Given this assumption set, would a State agency be likely to initiate cooperative programs which might be included in this content category?"

One final point should be mentioned. Throughout these "assumption sets" an initial premise is held constant: the State agency desires to hold costs down and reduce duplication wherever feasible. Since virtually all agencies appreciate the need for such economic restraint, it appears unnecessary to include this premise in the original list of assumptions.

Forms of Interinstitutional Cooperation
(Content Categories and Their Characteristics)

Assumption Sets

PROGRAM CATEGORIES	SET A Strong Bal. Qual.	SET B Strong Bal. Quan.	SET C Strong Imbal. Qual.	SET D Strong Imbal. Quan.	SET E Moder. Bal. Quan.	SET F Moder. Imbal. Qual.	SET G Moder. Imbal. Qual.	SET H Moder. Imbal. Quan.
Instructional Forms and Techniques	maybe	no	no	no	yes	yes	maybe	no
Joint Degree Programs	yes	yes	maybe	no	maybe	maybe	no	no
Faculty	yes	maybe	no	no	yes	yes	maybe	no
Student Exchange	yes	yes	maybe	maybe	yes	yes	maybe	maybe
Student Research/ Field Experience	yes	no	yes	no	yes	no	yes	no
Service and Applied Expertise	yes	maybe	yes	maybe	yes	maybe	yes	maybe
Facilities Sharing	yes	yes	yes	yes	yes	yes	yes	yes
Faculty Development	maybe	no	no	no	yes	maybe	no	no
Faculty Research	maybe	no	maybe	no	yes	maybe	maybe	no

Source: Marvin W. Peterson and John S. Waggett, "International Cooperation in Doctoral Education: A Report With Recommendations." 1972, pp. 89-92.